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Power wagon

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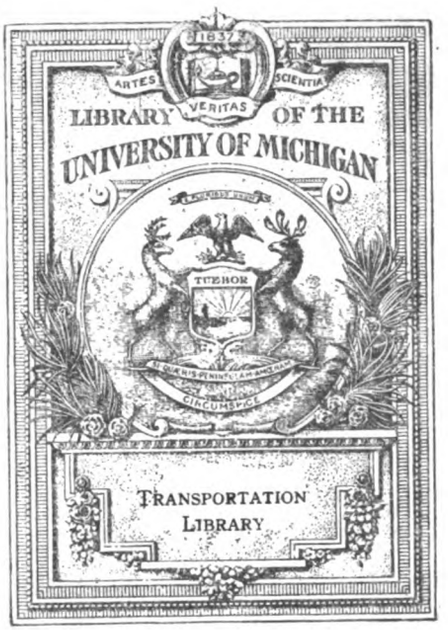

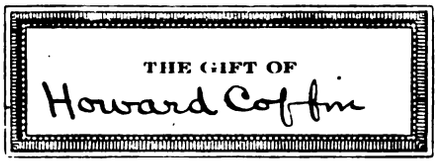

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THE POWER WAGON

No. 38. CHICAGO, ILL., JANUARY, 1908. Subscription, $2 per year. Single Copies, 20 Cents.

Studebaker

Modern Business Methods Demand Modern Equipment

It is the same in everything—the new way has come of doing old things—power delivery was bound to come and now it has proven that it has come to stay.

A power wagon can be driven as true as a die into a narrow door or passage and right out again. No confusion—no false starts and backing up—in short, no wasted time. It will do the work of three horse trucks and three drivers in less time and at considerably less expense.

The Studebakers have been building commercial power wagons since 1901 and this experience, coupled with their knowledge of the requirements of users of this class of vehicles gained in over fifty years spent in building vehicles for animal draft, has enabled them to produce various styles of commercial power wagons that meet practically every demand of the trade.

Send for our catalog. You will surely be repaid by a visit to our exhibit in the Seventh Regiment Armory at the Chicago Show.

STUDEBAKER AUTOMOBILE CO.

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General Office, Cleveland, Ohio

Branches:

New York
Chicago
Kansas City
San Frandisco
Dallas
Portland
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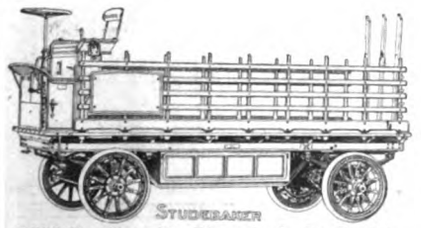
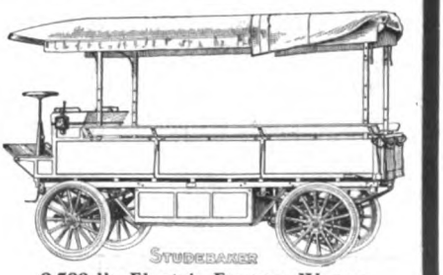


7,000 lb. Capacity Electric Stake Truck



2,500 lb. Electric Express Wagon

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MORE THAN 6 TO 1

over nearest competing type and make of solid tire equipment.

More than *twice* as many truck tires as all other makes combined is the record on cars at the New York and Chicago Auto Shows in favor of

"Firestone"

Side-Wire Motor Tires — The World's Standard

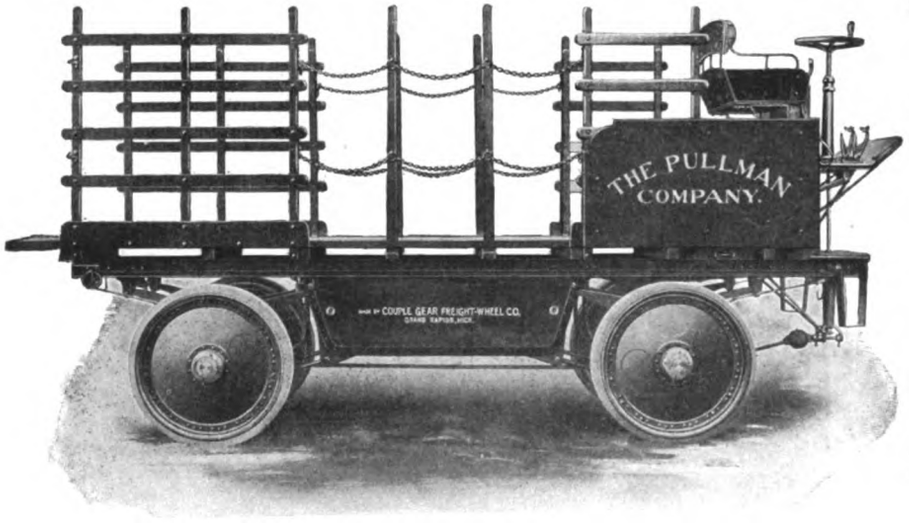
You know the Reason why

FIRESTONE TIRE & RUBBER CO.

Branches and Agencies Everywhere. AKRON, OHIO

Motors Contained in the Wheels

Single Reduction 25 to 1



Transmission Efficiency Guaranteed 97% at Full Load for the Motors

Four-Wheel Drive Four-Wheel Steer

THE "COUPLE-GEAR" ELECTRIC TRUCK

Equipped with "Storage Batteries" or with explosive engine and generator supplying current direct to the four motor-wheels.
Five-Ton Trucks, driven and steered from all four wheels, 5 speeds forward and 5 speeds reverse. Operate equally as well in either direction.
One-Ton and Two-Ton Trucks, driven and steered from the front wheels.
Write for catalogue describing the principle of "Couple-Action" as applied in Couple-Gear trucks. Power transmitted direct to both sides of the wheel at the rim.
We guarantee the current consumption and replace any parts which are worn beyond an efficient working condition within 1 year.

RESPONSIBLE AGENTS WANTED

COUPLE-GEAR FREIGHT-WHEEL CO. :: :: :: Grand Rapids, Michigan

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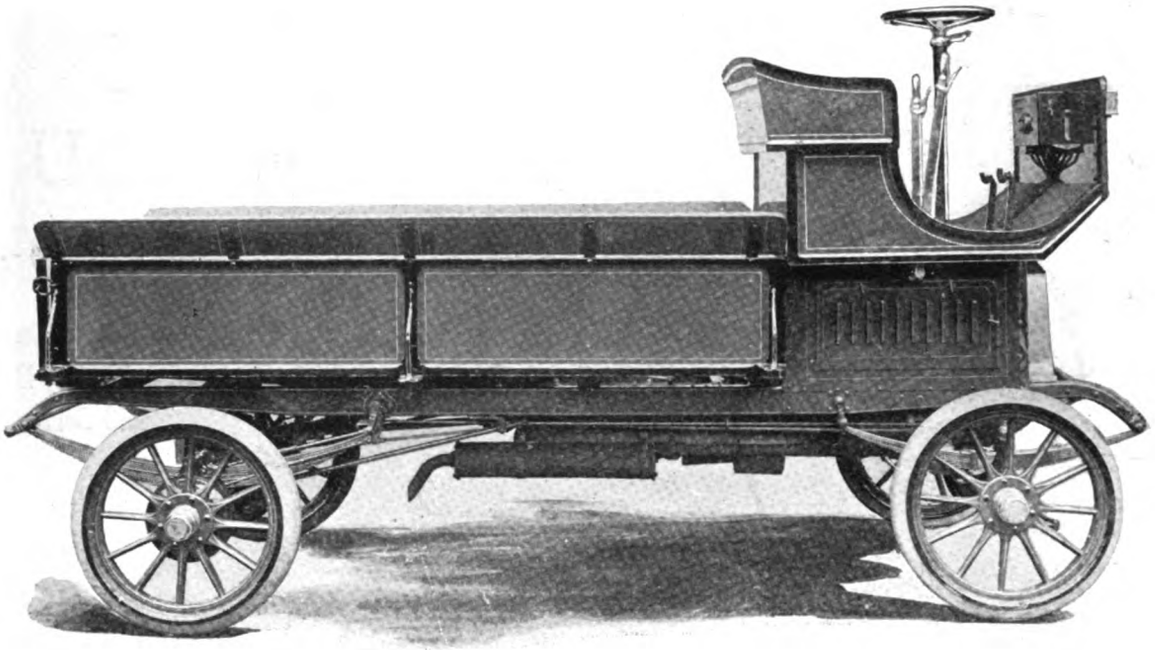
How This Motor Truck Helps Your Business



It does infinitely more work at less expense than two horses—for it delivers larger loads in ⅓ the time—never gets tired—needs less care than horses.

As an advertisement—**right now**—it is most excellent, for motor trucks are not so common that they are unnoticed. They attract the attention of everyone in passing, and with a good sign or trade mark create an impression of "up-to-dateness" for your business that gets customers.

The value in advertising you get from a Mitchell Motor Truck compared to the same value in newspaper space pays for the truck twice over in a year.

Look into this truck proposition.

Call up any Mitchell Agent and get particulars—or write the factory.

The Mitchell is 4-cylinder—worm-drive—20 h. p.—capacity 1 ton—speed 14 to 15 miles—price $2,000.

It is the neatest looking—staunchest looking—most reliable and efficient truck made. **Get the proof.**

Let the Mitchell Agent "Show You"—or write

Mitchell Motor Car Co.

Member American Motor Car Mfg. Association

233 Mitchell Street, RACINE, WIS

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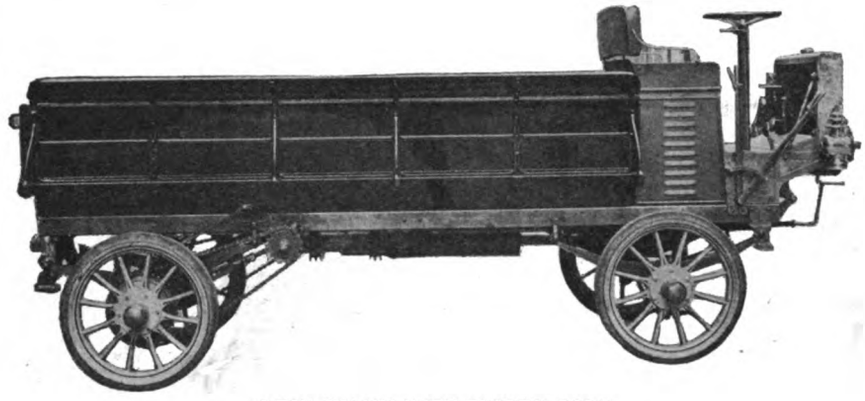
RELIANCE 1908 DETROIT



2-TON CHASSIS WITH EXPRESS BODY

DO YOU KNOW

We are To-day Building and Selling

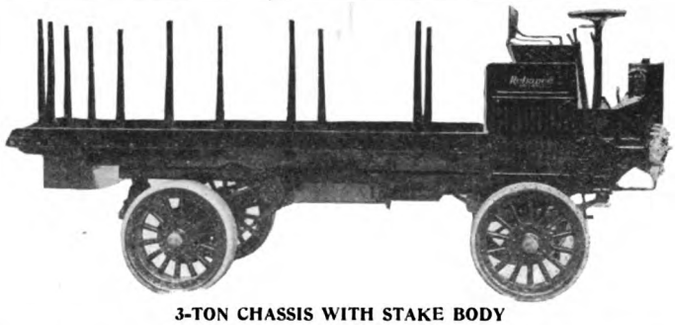
2-Cylinder, 2 to 2½ TON TRUCKS

3-Cylinder, 3 TON TRUCKS

4-Cylinder, 4 TON TRUCKS

EACH CAPABLE OF A 25 PER CENT OVERLOAD

THESE THREE SIZES



3-TON CHASSIS WITH STAKE BODY

Constitute the ONLY Capacities for Economical Trucking

Ask for Catalogue and Prices

RELIANCE MOTOR CAR CO.

Reliable Agents Wanted ::: **DETROIT, MICHIGAN**

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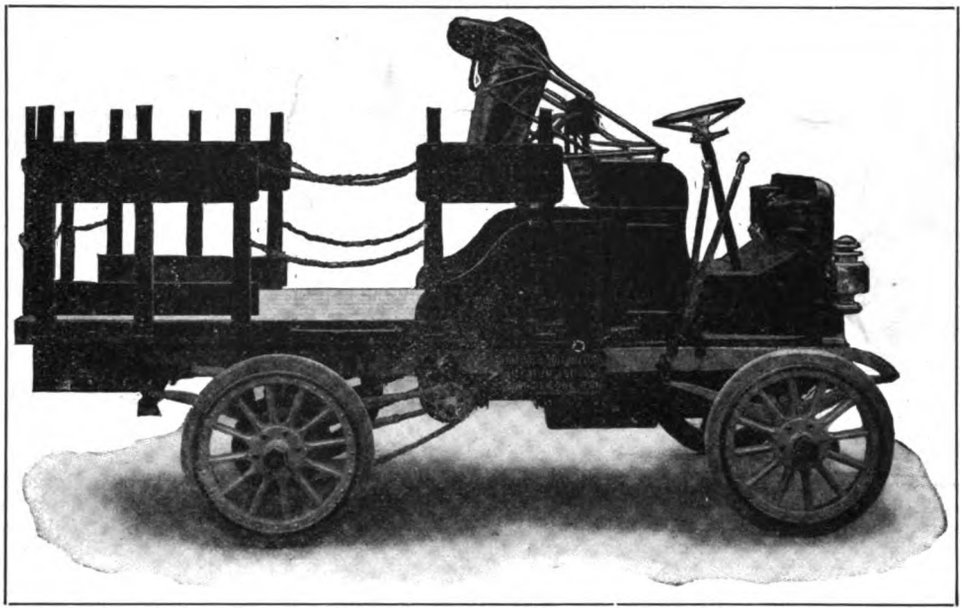
ECONOMY—COPPOCK

BUILT TO LAST **Years** NOT DAYS



ONE TRUCK DISPLACES THREE TEAMS

Cost of operation—less than 2 cents per mile.

It makes no difference what other commercial cars you have tried, without satisfaction—THIS is the ONE you have waited for, and will buy.

YOU WILL WANT PROOF.

All right. 30 to 60 days' trial in your own service, and you keep the tab. We solicit correspondence and will furnish full particulars and details.

COPPOCK MOTOR CAR CO.

FOURTH STREET, DECATUR, IND.

CARL HOLDREGE, Sales Manager :: :: :: 317 Railway Exchange, CHICAGO

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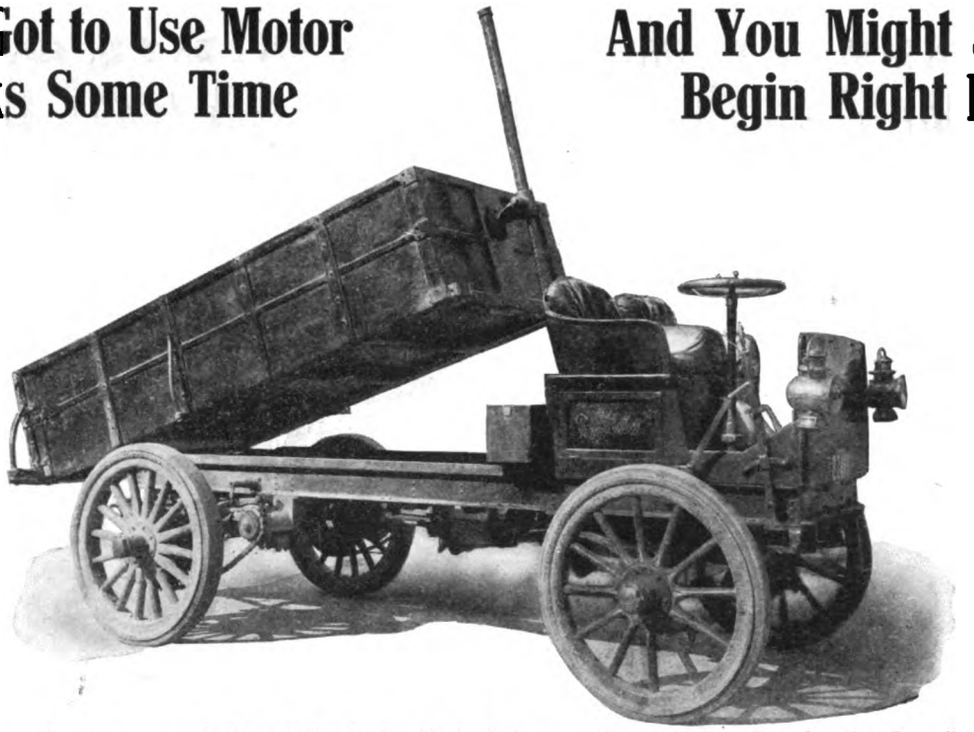
You've Got to Use Motor Trucks Some Time

And You Might as Well Begin Right Now



Regardless of the loads you have to transport, the Frayer-Miller Gasoline Truck will do your work economically and expeditiously. Regardless of the cold weather it will do it continuously. Its air-cooled four-cylinder engine works more satisfactorily in winter than a machine whose power plant is water-cooled. No freezing of the circulation. No interruptions to service—for which you have to pay. Regardless of what any prejudiced person may say, the motor truck—and particularly ours—will haul merchandise cheaper than horses if there is enough work for it to do. If there isn't enough work for the machine, stick to your draft animal transportation. Bodies to order.

Oscar Lear Automobile Co., Springfield, Ohio

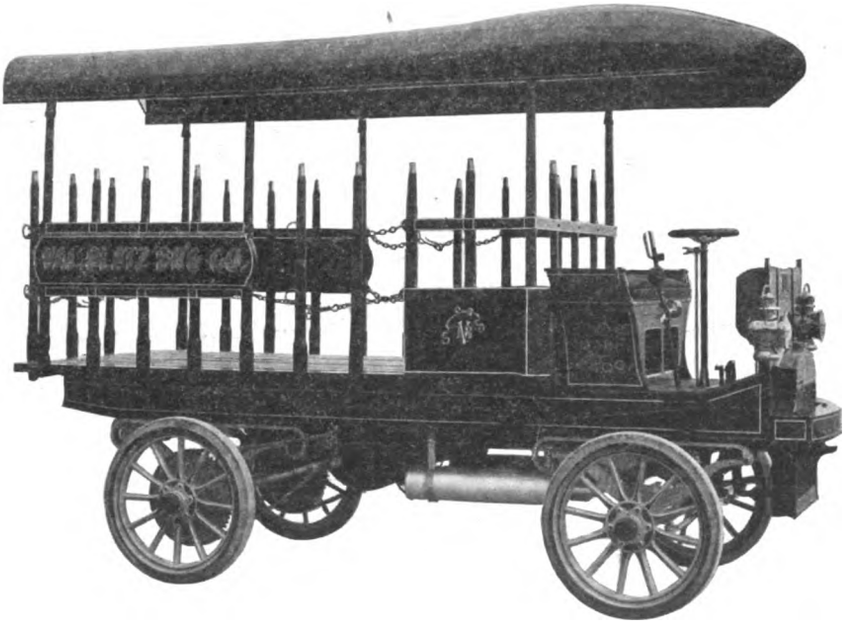
ONE, TWO, AND THREE TONS

THIRTY HORSE POWER

FORWARD AND REVERSE SPEEDS FROM 1 TO 10 MILES PER HOUR

CAN NOT BE OVERSPEEDED

THE MEISELBACH TRUCKS



FRICTION DRIVE—PERFECTLY SUPPORTED ALL WHEELS ON TIMKEN ROLLERS
POWERFUL BRAKES—THE SIMPLEST AND EASIEST CONTROLLED TRUCKS YET SHOWN

THE A. D. MEISELBACH MOTOR WAGON CO., North Milwaukee, Wisconsin

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

No. 38 **JANUARY, 1908** **No. 38**

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WALTER WARDROP, Editor

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Chicago's Singular Wheel Tax

Steel Tired Vehicles Drawn by Horses Are to Be Taxed Less Than Motor Vehicles Fitted with Rubber Tires

HEROIC measures are about to be adopted in order to keep the streets of Chicago in fit condition for traffic. It is calculated that henceforward the sum of $700,000 will be required annually to repair the principal thoroughfares, many of which are now in a pitiable state of decay. Having no revenue available for the purpose the administration is pressing the passage of an ordinance providing for the levy of a wheel tax under terms which are so inequitable as to cause the greatest indignation among the owners of automobiles of every kind.

The authors of this measure are conveniently blind to the degrees of mischief which are worked by the various forms of vehicle traffic. It suits their purpose to assume that all wheels, however shod, cause equal wear of street surfaces, or else are destructive in proportion as they represent refinement of transportation practices. The proposal to tax a wagon pulled by two stamping horses at $7.50 will commend itself to every reflecting observer of the havoc worked by steel tires and pounding hoofs. But one sees red upon learning that a rubber tired motor truck is to be assessed $30. Is it to be believed that a motor wagon rated to carry two tons is four times as destructive of street surfaces as a horse-drawn vehicle of equal load capacity? This is a fair sample of the injustice of the tax distribution. Assessment is light where it ought to be heavy, and oppressive where it should be otherwise.

The tax distribution is as follows:

One-horse wagon	$ 5.00
Two-horse wagon	7.50
Three-horse wagon	15.00
Four-horse wagon	25.00
Six or more horse wagon	35.00
Automobile runabout, two persons	12.00
Automobile truck, coach or bus	30.00
Touring car or roadster	20.00

* * *

The economists responsible for the measure evidently fixed upon the steel-tired one-horse wagon as the basis for reckoning. It seems reasonable to assume that such a vehicle will cause as much expense to the municipality as the terms of the tax provide. Light horse wagons, particularly those owned by the commercially irresponsible class, clip street corners and generally do more mischief with their narrow iron tires than heavier vehicles which are usually better appointed, better maintained, and more easily policed. They are the road lice of commerce, skidding, blocking traffic, and abrading and chipping the most durable forms of street pavement and road.

Every two-horse wagon probably occasions an annual loss of $7.50 to the city. Its heavily loaded steel tires and thrashing horses are fruitful sources of municipal expense. Probably, also, there is justification for the progressive taxation of three, four and six-horse wagons.

* * *

But it passes belief that it should be seriously proposed to tax light automobiles at the rate of $12 a year for the damage they occasion to roads or streets, especially the latter. Why, they barely press the earth, so perfectly are they suspended and cushioned. Motor wagons and trucks, taxed at $30, are peculiarly well designed and equipped for obviating city street repair losses. If one were to permit personal interest to sway opinion in this matter it might be pointed out that the sum which local owners of automobiles annually expend, in order that their machines may endure the abominable traffic surfaces laid

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down for horse-drawn vehicles, is vastly in excess of that required to keep the city streets in good condition of repair. Compelled to sustain this extraordinary expense they are now asked to submit to extortionate taxation in order to remedy a situation largely created by the natural enemy of motor traffic.

* * *

Simple justice would seem to demand that the owners of vehicles which are most active in causing damage to streets should bear the heaviest burden of their repair. It is obvious, of course, that the adherents of motor traffic do not seek to evade taxation. They clearly recognize the necessity for and importance of good streets. Indeed, as they compute the advantages derivable therefrom, they are willing and even anxious to contribute their due share of the cost of the contemplated improvement. The theory of a wheel tax for the maintenance of the streets is sound. So also is the principle of graduated taxation. It is the method of application only which is vicious and unsound.

* * *

While not pretending in the least to abate the damage done to streets by horses and steel-tired wagons, it is yet fair to state that these factors are not wholly responsible for the deterioration now so noticeable. Unscientific paving methods and poor street materials contribute not a little to the rapid impairment of thoroughfares. Some assurance should be given before the wheel tax is imposed that the revenue obtainable therefrom will not be spent, as in the past, upon laying surfaces which are about as durable as jujube paste.

It is proposed that the money to be raised by levy of the wheel tax shall be set apart exclusively for street repair and maintenance. Under the present system pavements are originally provided by real estate owners who are also expected to pay for subsequent improvements. It is, of course, manifest that the first mentioned charge is justifiable, but it is equally plain than the direct beneficiaries of well maintained streets should be compelled to pay for their up-keep.

* * *

Municipal statisticians have classified the revenue to be obtained from a wheel tax as follows:

Automobiles, 6,000	$120,000
Single-horse rigs, 45,000	225,000
Double-horse wagons, 25,000	250,000
Three-horse spikes, 400	6,000
Four-horse wagons, 3,600	72,000
Total	$673,000

Observe that of the 80,000 vehicles using the streets those motor driven form only one-thirteenth. Yet they are expected to yield one-fifth of the total tax revenue. How would you describe such a proposal—as evidence of statesmanship, or as a plain intention to squeeze those who are presumed to be least likely to offer successful resistance.

MOTOR WAGON MAKERS TO ORGANIZE.

SEVERAL well attended meetings of the makers of industrial motor vehicles were held during the week of the Chicago show for the purpose of organizing an association to which all will be eligible who can show that they are active factors in the upbuilding of the industry.

Committees were appointed to prepare governing rules and articles of incorporation, and do such other preliminary work as may be necessary. A provisional board of management was appointed, with Mr. H. G. Hamilton, of the Rapid Motor Vehicle Company, as chairman. Mr. G. W. Weeks, of the Weeks Commercial Motor Vehicle Company, was chosen treasurer. It is expected that Mr. Hamilton and Mr. Weeks will effect an exchange of office if the board will give its consent. Headquarters of the association will be located in Chicago.

The organization, which will be known as the Commercial Motor Vehicle Manufacturers' Association, will assume control of exhibitions and trials, both of which highly important functions, instead of being at the mercy of shrewd promotors everywhere, will be conducted with a nice regard for the interests of those who participate in them. Big work lies ahead of the association in campaigning for the development of motor road haulage.

One of the Adam's Express Company's motor wagon drivers in New York was recently arrested for causing the death of a man who was knocked down and run over by the machine.

PUBLIC SERVICE VEHICLES IN ST. LOUIS.

AN EXTENSIVE equipment of electric public service vehicles is to be installed in St. Louis by the St. Louis Auto Exchange Company, which is being organized by C. J. Lewis and Hugo Kock. The investment will be close to $200,000.

Forty-five machines will be needed for the service. Twelve buses will be commissioned exclusively for hotel and depot service. Ten sight-seeing cars, also electrically operated and carrying from 15 to 30 passengers, will also be operated. Ten more buses will ply the streets. Six opera coaches and machines for miscellaneous use account form the balance of the equipment.

FIRE AT THE CHICAGO SHOW.

ON the second day of the Chicago show considerable excitement was caused by a fire which burned all of the draperies concealing the roof of the exhibition hall. An overheated stove in one corner of the building set fire to the adjacent bunting, and in a few minutes the flames had run from one end of the building to the other. The damage done, however, was very slight, none of the exhibits suffering in any respect worth mentioning. As it was deemed necessary to break the glass in the roof in order to let the smoke escape some hours necessarily elapsed before the building was again made habitable.

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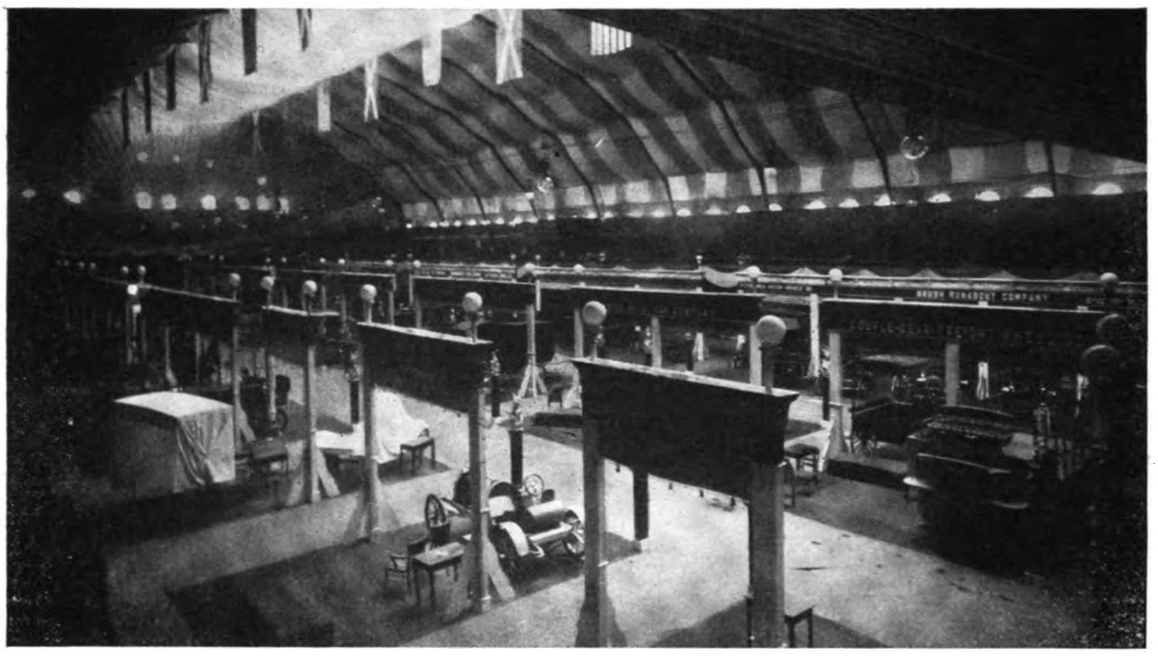

Main floor of the First Industrial Motor Vehicle Show ever held in this Country.

Successful Despite Difficulties

Chicago's Industrial Motor Vehicle Show Accomplishes the Purpose for Which It Was Held

WHEN time has softened early impressions of the first exclusive commercial motor vehicle exhibition ever held in this country, and the affair can be viewed in its true perspective, it will be generously conceded that it admirably fulfilled its chief purpose. In the years to come there will be other and larger shows than that which was staged in Chicago last month, but never again will there be one for which can be claimed the distinction of having wrought so powerfully at a critical moment in establishing the vigor and importance of the industry represented.

One forgets or indulgently overlooks the shortcomings of the exhibition itself out of gratefulness for what it accomplished in this respect. Surely it was much that it directed a nation's attention to the economic advantages of motor delivery, motor trucking, and kindred forms of motor road transportation. But, of greater momentary importance than this, it taught the commercial world to regard the manufacture of industrial motor vehicles as a specialized vocation which is but slenderly related to the business of building automobiles for pleasure. This definition of purpose was, perhaps, the most important achievement of the show, all else being minor or accidental. And it was a well-timed stroke of policy, for a public, prone to error in discriminating between industrial aims which seem alike while yet very unlike, has for years been deluding itself with the ridiculous notion that the success of motor road haulage awaited the attention of those who are supposed to be engrossed with the manufacture of touring cars and runabouts.

* * *

Right here it is appropriate to observe that the show exerted a very marked influence upon the plans of many automobile manufacturers not hitherto suspected of being anxious to participate in the more sober branch of the industry. The evil times, the clouded outlook for the sale of luxuries of any kind, and the necessity for striking deeper root and finding further use for plant, buildings and investment, no doubt enhanced the importance of the exhibition for many establishments which till recently have been cruising with a free sheet and a fine drawing sail. Many otherwise capable observers, blinded in the past by self-interest, confessed their astonishment that the business of making and selling utility machines had made such progress as was evidenced by the partial display of its elements in Chicago. The more they marveled the more they lamented their short-sightedness in not earlier having taken pains to be informed of the condition spread out before them. Forthwith half a dozen of the largest touring car makers in the country resolved to get a foothold in this promising industry. Engineers were summoned from factories by telegraph and many grave consultations resulted between selling and producing departments.

* * *

This was not wholly unexpected. It was impossible to think that the course of automobile construction could forever flow in the direction in which it had been started. The nation is not rich enough to support the enterprise of all who wish to sell luxuries. There is too much crowding at the top where, according to popular opinion, there is supposed to be plenty of room. Relief lies in the manufacture of machines which sell because they can earn their cost and keep. In good times and bad there is always a demand for an instrument which is more economical than

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another which it is designed to supersede. Only when prosperity reigns can luxuries be freely sold.

There is plenty of proof to confirm the opinion that the exhibition exerted a wholesome general influence. The scant attendance—scant only in comparison with the pushing, moneyless, curious throng which regularly infests touring car exhibitions—was not remarkable considering the relatively small number of establishments which really are in position to buy machines for transporting their merchandise. It is always to be remembered in measuring the externals of the industrial motor vehicle industry that the potential buying capacity of its supporters is inversely proportioned to their numbers. For example, there are not more than 5,000 concerns in Chicago whose commercial rating or transportation operations justifies the expectation that they would now or in the future replace horse with machine labor. But it is their investment in vehicles which supplies the bulk of the amazing volume of street traffic. An attendance of 5,000 people bent upon purchase, or even half that number, would if representative of this class, be astonishingly rich in purchasing power. Not so, however, in other automobile exhibitions, particularly if care is taken to exclude the professional buyer, the agent, from the census. A low estimate of those who witnessed the eastern and western national touring car shows puts the number at 750,000. The annual factory production is not one-tenth of that number. Special values, therefore, must be given to the character of those who put in an appearance at special exhibitions.

* * *

This much it has been necessary to say in extenuation of the moderately small attendance at the motor wagon division of the Chicago show. Nobody but the callow youngsters who estimate the importance of every public occurrence by the size of the gate receipts expected a crush, and hence there was no disappointment on that account. It was plainly observable, however, that the representatives of concerns which it was most important should be awakened to an interest in motor haulage were there in sufficiently impressive numbers to satisfy exhibitors. With better location, better advertisement, and free from the sinister influence of adjoining touring car exhibits, it is possible, even probable, that the business machines would have attracted more spectators and inquirers anxious to know the nature and extent of their economy. As it was the interest shown in them was lively, though it was never very pronounced.

* * *

Perhaps the best evidence of the material success of the exhibition lies in what was accomplished during the weeks following. Scores of purchases, originating at the show, were concluded after it had ended. The value of sales traceable to the display was large, much larger in fact than the most sanguine anticipated, proving that the main purpose of the exhibition had been achieved and that the inherent advantages of the power wagon have not been misrepresented.

Unthinking critics who make a practice of shuddering at any public spectacle which does not present proportions of extraordinary immensity affected to see in the exhibition only the birth of an industry. They could not realize, nor was it plain to any but the initiated, that from the factories represented by the score or more booths had issued during the past few years many million dollars' worth of products such as were on view. Novelty is not the term to apply to an industry which has produced over 12,000 units costing on an average $3,000 apiece.

* * *

Although eight concerns withdrew at the last moment twenty-one exhibited machines designed for various industrial uses, classified as follows:

Gasoline vehicles	17
Electric vehicles	4

The predominance of gasoline machines is indicative of the aggressiveness of the makers of vehicles of this type. The absence of steamers was greatly regretted, as it was hoped that at least two of the three concerns manufacturing such vehicles would have put in an appearance. The gasoline-electric type was also unrepresented although until the last moment it was confidently expected it would have been in evidence. The flurry in the money market, while it did not lessen the importance of the exhibition, certainly hindered it from being as thoroughly representative of the industry as it would have been if more favorable business conditions had prevailed.

* * *

There was a noticeable tendency in the direction of simplified construction and the employment of superior materials. Speeds, however, still remain unnecessarily high. Friction transmission was seen in the product of four concerns and four wheel drive in the product of one. Three firms which exhibited proclaimed the merits of two cycle engines, while four argued the advantages of air cooling.

As yet there does not seem to be any marked desire to construct machines for very light loads. There is no lack of vehicles to carry 1,000 pounds and upwards, but only a few concerns seem to have given consideration to the building of machines of lower rating.

ILLUMINATING THE TOP DECK OF BUSES.

THE illumination of the top deck of motor buses is the latest refinement in public service vehicles. Although at present it is confined to electric machines, it is certain to be employed for the convenience of outside passengers on all other types of buses.

An electric light standard is erected at the rear corner of the top rail. Three incandescent lamps are attached to it, and their light reflected forward so that top deck passengers may read.

Since their installation ten months ago the Milwaukee mail collecting motor wagons have traveled more than 35,000 miles.

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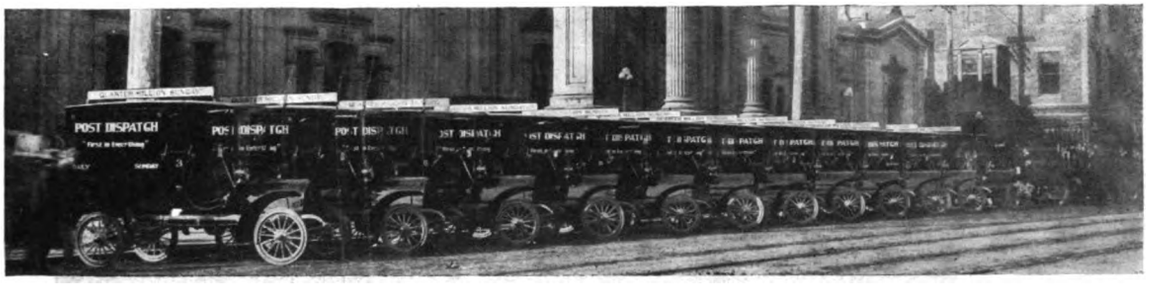

Fleet of newspaper delivery wagons used by the St. Louis Post-Dispatch.

Delivering Daily Papers by Motor Wagon

The St. Louis Post-Dispatch Employs 14 Machines to Do Work Formerly Requiring 45 Horse Drawn Vehicles

IN the conduct of a metropolitan daily paper there are no occurrences scheduled for regular performance which are of more importance than the rapid delivery of its press issues into the hands of its distributing agents. Trains which carry papers far into the country are not operated to suit the convenience of publishers, and local dealers grumble at the loss of a few seconds' time in commissioning their army of subordinates to catch the elusive penny. It is touch and go from the very moment the lever is jerked in the press room until the product is on the street or railway cars.

And the rivalry is extraordinarily keen to see which paper can most expeditiously serve its clients with piping hot intelligence of the hour. The afternoon papers, in particular, give especial value to the time element in distribution, the quick succession of regular and special editions calling for the speediest mode of conveyance if local circulation is not to be confined to a very small area before night falls and people have abandoned their haunts of work for the day.

But though circulation department chiefs are very justly famed for their alertness in perceiving opportunities which can be made useful in the rapid distribution of papers, it has not happened until very recently that they took notice of the availability of the power wagon in such work. In New York, Chicago and Washington, only to name three of the great sources of news in the country, there has been much futile experimenting with an instrument that is already doing splendid work in a large way in St. Louis. While the proprietors of publications in many of our large cities have been calculating the profit, either in time or money, to be gained from the substitution of mechanical for animal delivery, exciting themselves over the relative advantages of this form of construction and that, and generally exhibiting a desire to solve questions which automobile engineers declare will remain unsettled for a long time to come, the Post-Dispatch, a property controlled by the shrewd Joseph Pulitzer, has actually undertaken to deliver exclusively by machine. "First in Everything" is the motto of the Post-Dispatch. It certainly is facile princeps in this particular undertaking.

Fourteen wagons of 1,500 pound rated capacity, equipped with 20 hp. air-cooled engines are regularly doing the work of 45 horse drawn wagons, insuring a saving in drivers' wages alone amounting, at an average of $15 apiece per week, to almost $25,000 a year. In addition to this equipment two motor trucks, rated to carry three tons, are being used in railway depot work for the Sunday edition, and to haul unsold copies of other issues back to the Dispatch office.

The top speed of the Post-Dispatch wagons is 15 miles an hour. For the comfort of the drivers in cold weather the usual foot board is dispensed with, the operator's feet resting upon a grating through which heat from the engine ascends. Each wagon makes four trips daily, each varying from four to fifteen miles in length.

The wheel base of these wagons is 108 inches. Tire dimensions, front and rear, are 32 by 3½ inches. Empty, each wagon weighs 1,800 pounds. Four expanding and contracting brakes are fitted. A two speed sliding gear transmission is used, all gears being idle on high. The machines are being garaged by the Logan Motor Dispatch Company, which concern also supplies the drivers.

REGISTERING FARES ON NEW YORK BUSES.

PASSENGERS on the New York motor buses assist in registering their own fares. On the side of the register, which is held by the conductor, is a bell. A dime is slipped into a slot in the instrument, and when the conductor pulls a trigger the bell rings and the coin falls to the bottom.

A company having capital stock of $1,000,000 has been formed to operate motor buses in Los Angeles and Riverside, Cal.

Eighteen motor wagons took part in the recent military maneuvers of the Italian army.

Motor buses to carry mail as well as passengers are to be operated between Odessa, Shafter Lake and Seminole, Tex.

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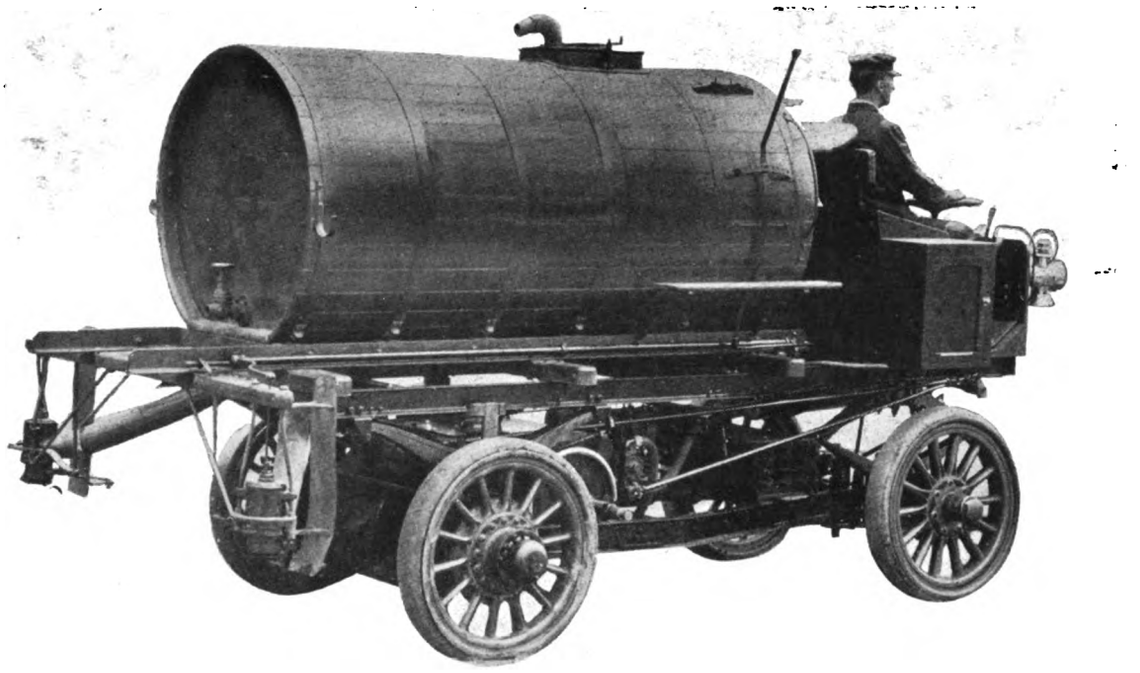

Boston's Gasoline Motor Sprinkler.

Municipal Motor Wagons

How Their Economy is Demonstrated in Street Cleaning, Sprinkling, Refuse and Dust Collection

OUR system of rewarding political service with public employment makes it desirable that no municipal economy be projected which will interfere with the petty graft of party workers. This partially explains why our foremost municipalities are so slow in taking advantage of the economy of motor wagons for refuse hauling, street watering, garbage collection, and other duties wherein their value has been well tried and proven. Any contemplated reduction in the number of units gives the practical politician the blind staggers. He is loth to aid the cause of a reform which is sure to lop off his ancient privileges. Machines eliminate waste in human labor. That is enough for him.

* * *

The Situation When Snow Falls.

Every time the streets of a city like Chicago, New York, Philadelphia or Boston are thickly carpeted with snow thousands of men with carts, brooms and shovels are put to work, first clearing a passageway for traffic before they leisurely remove the piled mass. Thus the city pays at least twice as much for such work as would be necessary if it were done by motor propelled and motor operated apparatus. This occurs with such frequency that one is led to inquire if any sane ideas prevail among our municipal officers with respect to street administration beyond these which custom honors.

A motor sweeper will lessen the cost of street cleaning by fully 50 per cent. It will remove snow, filth or dust from three blocks of pavement each 60 feet wide, in about 30 minutes. One man can operate it. It will clear a path from eight to ten feet wide and raise the sweepings to a receiver holding a cubic yard. It can perform continuously at this rate. On the other hand, human labor at the same employment is with difficulty kept to its work. And it is costly. Dorsal muscles must be eased and strength recruited. Humans who clean streets are idle half the time for which they draw pay. A pitying world respects their weariness and revolts at the necessity which compels them to endure such degrading employment.

* * *

What Foreign Municipalities Are Doing.

The importance of removing street refuse or snow from city streets by means of mechanically operated vehicles is better understood abroad than here. Possibly this is because street administration is largely the study of amateurs in this country. Whatever the cause, our municipal executives have much to learn concerning approved modern methods for keeping streets presentable and fit for traffic. For three years past the principal streets of Paris have been swept and sprinkled by motor vehicles. In Berlin the city council is considering the immediate supersession of animal and human labor by machines, and, basing its expectation upon British experience, hopes to realize an immense economy by the contemplated change. At a recent meeting of the Hamburg council, composed of 120 citizens elected for a period of six years, who with the senate form the government of Hamburg, it was the duty of one of the committees to report on the introduction of an up-to-date system of removing street filth. It transpired that the members had visited England for the purpose of studying the various systems in vogue there, and found many instances where self-propelled vehicles were at work. The committee

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strongly recommended the government to lose no time in adopting automobiles for the removal of Hamburg's street refuse.

* * *

Boston and Hartford's Machines.

There are only two cities in America which use municipal motor wagons of the type now under consideration. In making this assertion we purposely ignore the rapidly increasing use of motor driven fire apparatus. Boston and Hartford use motor street sprinklers. The machine owned by the Boston authorities is operated by a gasoline engine. The Hartford machine is electrically driven. Cincinnati is on the point of buying motor driven street refuse wagons.

The Boston motor sprinkler performs the work of three to four horse drawn watering carts and sprinkles in a perfectly even manner streets varying in width from 50 to 55 feet. It will cover a distance of 200 miles without replenishing its fuel supply. A year and a half ago the vehicle was ordered and delivered to the metropolitan park commission of Massachusetts. It is in use on the road stretches of the Revere Park reservation.

One of the difficulties attending the employment of horse drawn street sprinklers lies in the inability of the driver to adequately control the water supply, which is varied by the uneven gait of the animals. Thus, if the horses are tired, the driver is compelled to regulate the flow by manipulation of control devices. This difficulty is obviated by the employment of motor street sprinklers, as their rate of travel can be accurately regulated. The speed of the motor sprinkler, which performs its work at a rate of travel not to exceed 6 to 8 miles an hour, is three times as great as that of a horse drawn sprinkler. This is the most important measure of its economy, implying, as it does, the utilization of fewer vehicles to lay the dust of a given linear surface and, by reason thereof, the employment of fewer horses and attendants.

The tank of the Boston motor street sprinkler is mounted on a 3-ton chassis fitted with 24 hp. motor, sliding gear transmission, spur gear drive to the rear axle, and selective control giving three forward speeds and one reverse. The wheel base is 9½ feet, the tread 58 inches, the wheel diameters 36 inches. The tires are 7-inch solid rubber in rear and 5-inch solid rubber at the front. The total weight of the vehicle, without load, is 6,000 pounds.

* * *

Liverpool's Economical Wagons.

But it is in England that the most reliable information pertaining to the work and value of municipal motor vehicles is found. Such machines have been at work in many large cities there for eight years past. Their performances have been closely observed by the corporation authorities, and in every case where good judgment has been exercised in their administration they have shown remarkable economy.

The superiority of municipal motor wagon service over that afforded by horses is very marked wherever the machines are being operated under conditions suitable for them. Liverpool's experience, epitomized in the figures submitted below, proves the truth of this assertion.

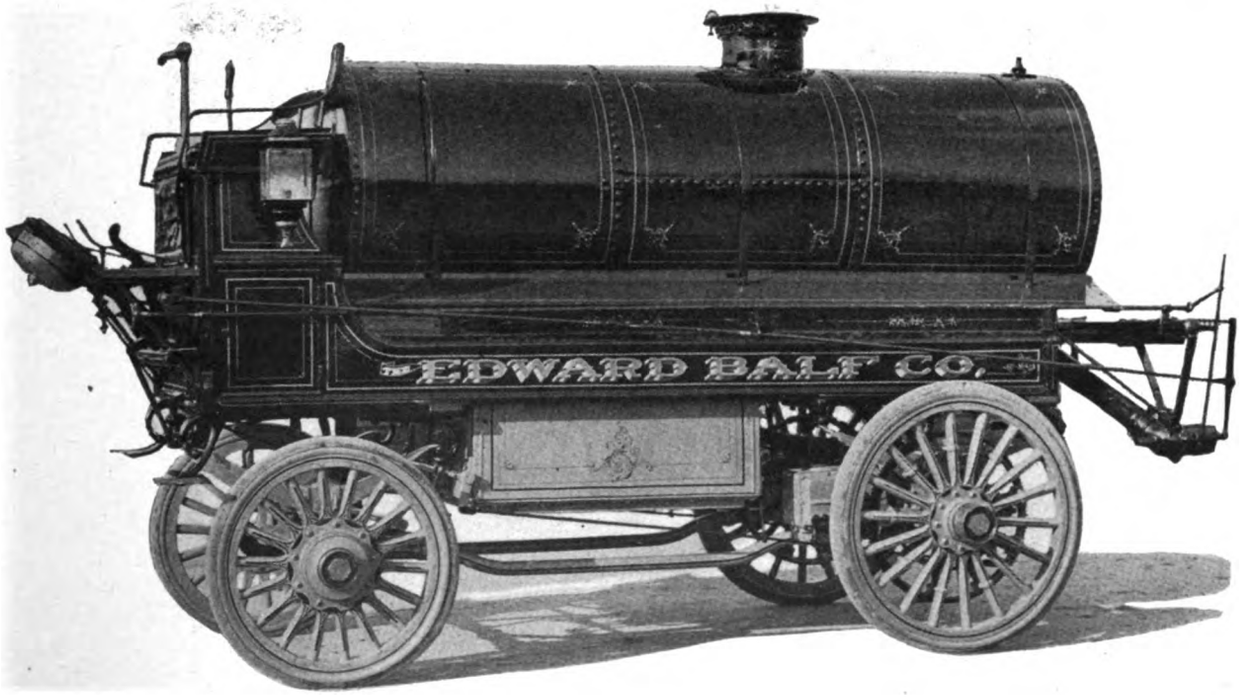
* * *

Comparing Municipal Horses with Municipal Motors.

The following table gives an accurate idea of the economy of municipal motor vehicles over various distances.

Miles.	Horse Loads.	Total of Horse Loads in Tons.	Motor Loads.	Total of Motor and Trailer Loads in Tons.	Horse Cost per Ton.	Motor Cost per Ton.
2½	3	5½	4	29½	$0.41½	$0.27
1¾	4	6¾	4½	33	.33	.24
1½	5	8½	6	44	.26	.18
1¼	6	10⅛	6	44	.22½	.18
1	7	12	6	44	.18½	.18
⅞	8	13	6	44	.17	.18
¾	9	15¼	6	44	.14½	.18

Liverpool's city engineer has in the past seven years



Electric Street Sprinkler used in Hartford, Conn.

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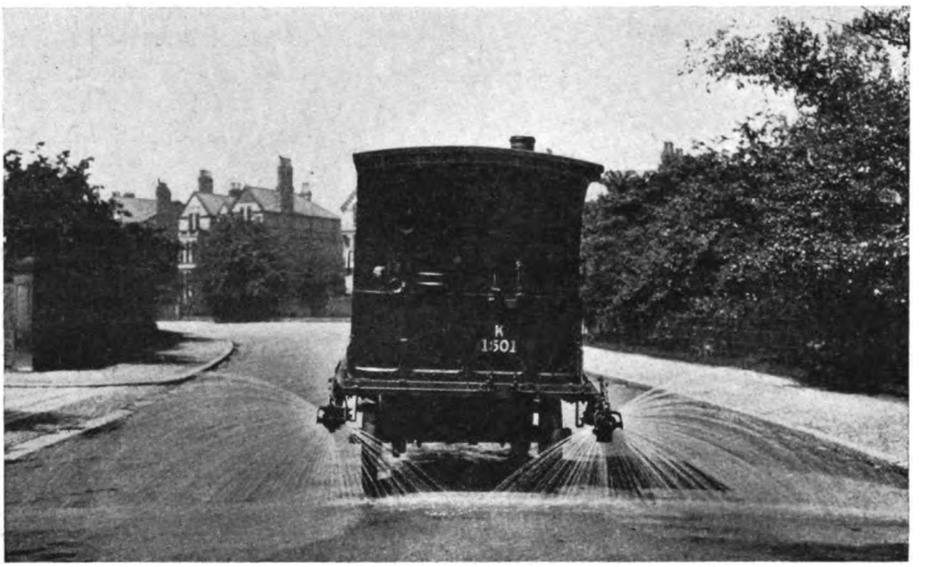
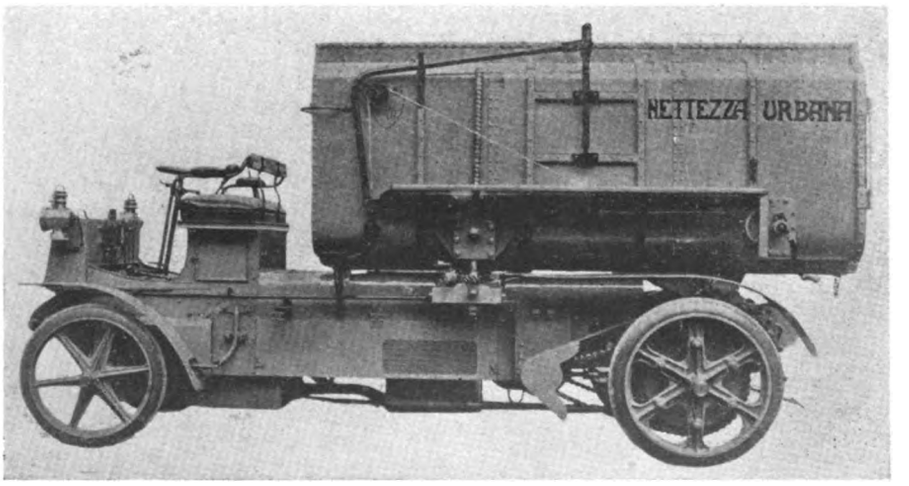
Municipal Motor Wagons



Motor Watering Cart—Sixty-foot Spread.

Tipping Dust into the Destructor at Liverpool.



Four-ton Steel Dust Wagon used in Rome, Italy.

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acquired more reliable statistical information concerning the economy of municipal motor wagons than any other public servant in the world. This is a large statement, but it is undeniably true.

The eight 5-ton vehicles under his control average 245 working days in the year. Their average annual maintenance amounts to $1,950.82 apiece. Each machine pulls a trailer. Wagon and trailer are loaded in 80 minutes. The load on the motor is 9,500 pounds. The trailer load is 5,150 pounds. Each wagon makes four journeys daily and occupies 30 minutes running to the refuse destructor, 18 minutes tipping and 27 minutes returning empty. Each round trip, therefore, averages 155 minutes.

One horse and cart will only make three round trips daily, taking 80 minutes to load 3,400 pounds, 58 minutes for the trip to the destructor, 15 minutes to tip, and 50 minutes for the empty return journey, a total of 203 minutes.

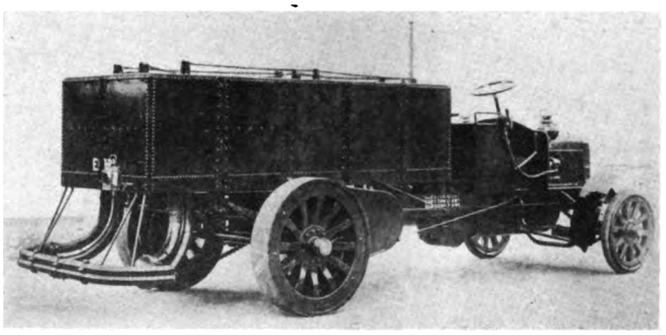
In 10 hours and 20 minutes the motor wagon collects 58,400 pounds of refuse and disposes of same, while a horse and cart requires 10 hours 6 minutes to collect and dispose of 10,200 pounds. The 5-ton motor wagon frequently pulls 8-ton loads. The average distance of each round, whether by horse or motor, is 4½ miles. The cost of the motor per day is $7.92, or 34 cents per ton. The cost of draft animal carting is 42 cents per ton, according to the Liverpool engineers' figures, which of course are absolutely accurate.

* * *

A Perfect Organization.

It will be noticed that the organization in Liverpool is so perfect that it takes no longer to load a steam wagon and trailer with 8 tons of refuse than it takes to load 1¾ tons of similar material in a horsed vehicle. The unloading of a motor and trailer necessarily takes a little longer than the same operation with a horse and cart. A great gain is made by the motor and trailer in journeying loaded and empty. This is, of course, due to the superior speed of the machine.

As there is little to be gained by using the motors on very short routes, horses are mostly employed thereon. The motors are kept on the 3-horse load routes as long as there is sufficient work for them; otherwise they are placed on as long journeys as possible.



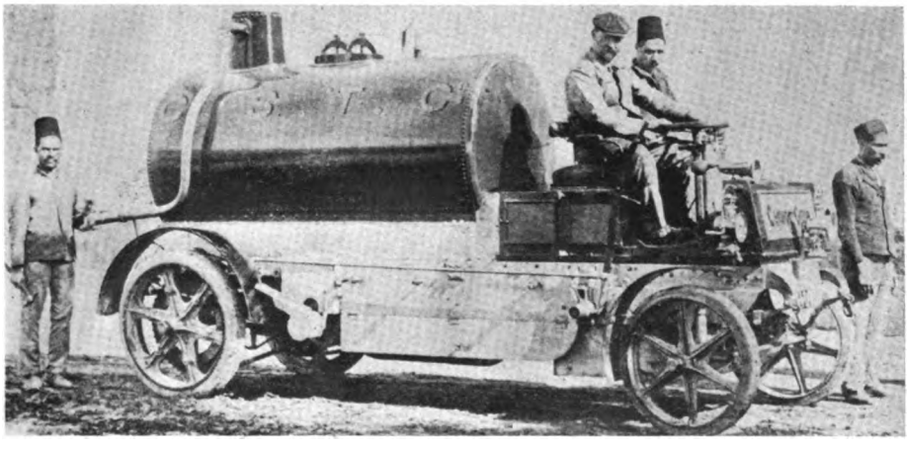
First gasoline municipal watering and refuse collecting Wagon used in England; capacity, 600 gallons; steel tired wheels.

The first of Liverpool's municipal motor wagons was bought in 1899. It is still at work. Six more were purchased in 1901, and these also have been in continuous use up to the present time. The vehicles were at first put on ordinary day work, but as they did not compare so favorably with horse haulage as was expected they were for about a period of eighteen months put on double shifts. This had the effect of reducing the cost to a point below horse haulage. As the vehicles in question were principally used for collecting refuse and conveying it to the destructor stations, the working of double shifts was found a great convenience, the material coming in at approximately a constant rate throughout the working hours of the destructors, which were already on double shifts from 5 o'clock in the morning to 12 o'clock midnight, or a total of 19 hours per day. This method of working was found especially suitable for the distribution of refuse to the destructors, which were used for steam raising purposes.

* * *

The Adoption of Trailers.

The most serious hindrance to this method of working arose from the complaints received from persons who were disturbed either in the early morning or late at night by the noise and vibration of the vehicles passing their houses. The objections on this ground became so numerous and continuous that it was ultimately decided to restrict the use of the vehicles to the hours between 7 o'clock



Municipal Sewage Wagon used in Cairo, Egypt.

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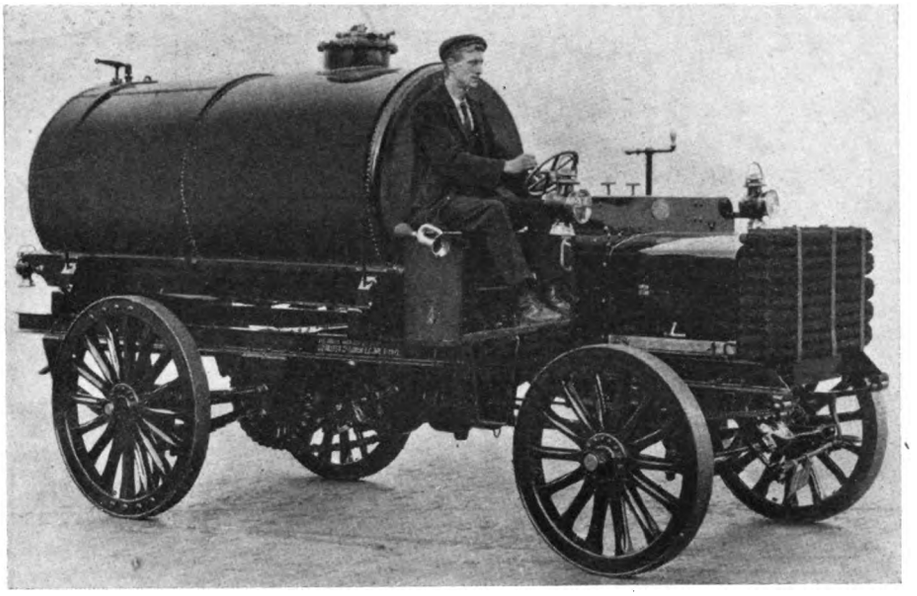
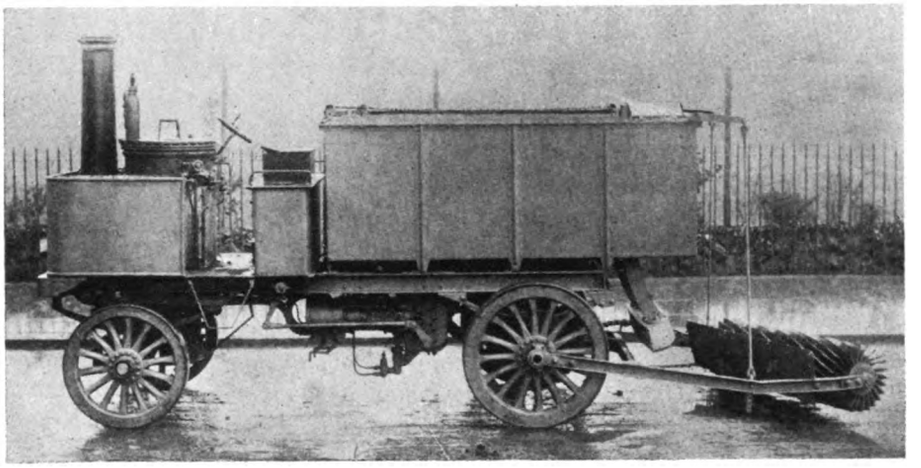
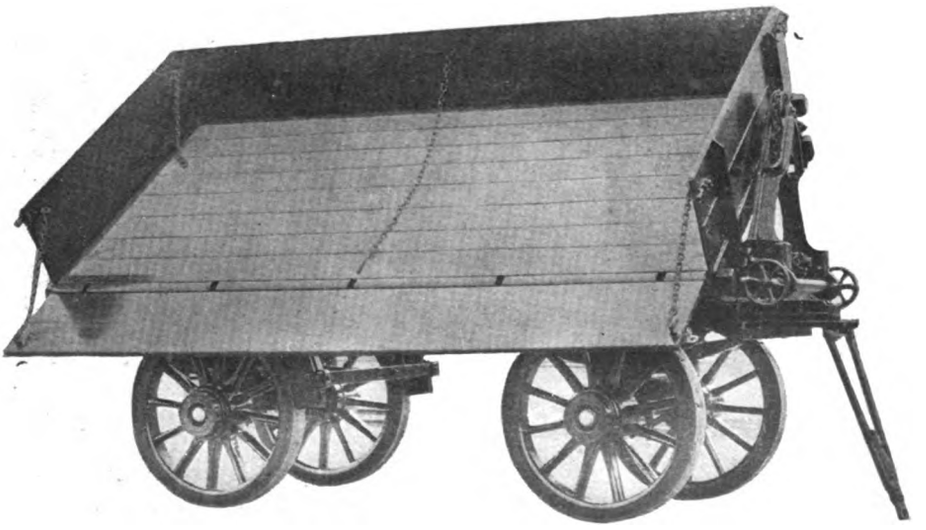
Municipal Motor Wagons



Another Municipal Watering Wagon. Capacity, Two Tons.



Mctor Street Sweeper used in Liverpool.



Trailer constructed to steer exactly in track of Power Wagon. Can be backed into position. Fore-carriage steered by hand-wheels shown on either side.

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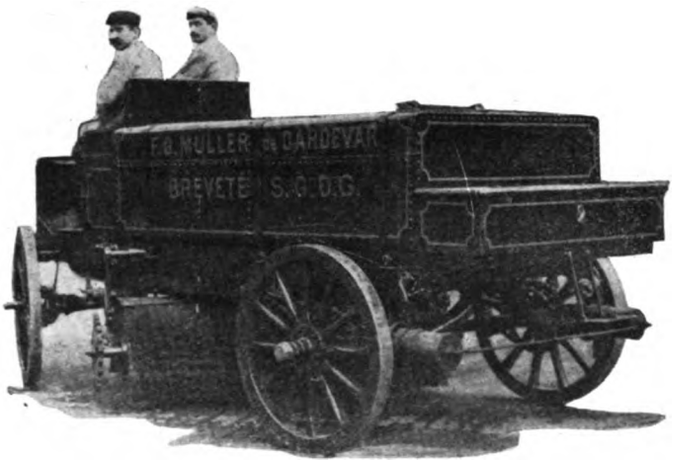


Motor Street Sweeper used in Paris.

a. m. and 7 o'clock p. m., and to reduce their speed when loaded.

It was again found that the vehicles were not comparing favorably with horse haulage, and with the object of obtaining better results trailers were adopted. Owing to the number of large municipal horse team wagons available, these were utilized as trailers for the motors. Some little difficulty was experienced in getting these vehicles to track properly with the motors, owing to the fact that most of the weight came upon the rear axle, and only a small proportion on the front or steering axle. By arranging the draw-bar, however, so that the pull from the motor came upon the body of the trailer, and making use of the bar from the front wheels for steering purposes only, the difficulty was overcome, and the vehicles as now arranged give every satisfaction.

A local difficulty which arose may here be mentioned. It was found that young boys were much attracted by these vehicles, and that they would persist in attempting to ride on the short length of the draw-bar connecting the motor with the trailer. Notwithstanding repeated warnings several serious accidents occurred. This practice increased to such an extent that it became necessary to provide the front of the trailer with a semi-circular sheet of iron casing, so that no hold remained for the boys. This accounts for the somewhat singular appearance of the trailer shown in one of the illustrations.

* * *

Annual Working Costs.

A fair statement of the annual working costs of one of these vehicles, based on the present year's expenditures, would be as follows:

Repairs, including renewals	$ 656.96
Wages of driver and assistant, including night men at depots	602.86
Fuel, oil and stores	269.20
Sundries, including insurance, establishment charges, and contingencies	118.80
Interest, 3½ per cent, and sinking fund based on life of ten years	303.00
	$1,950.82

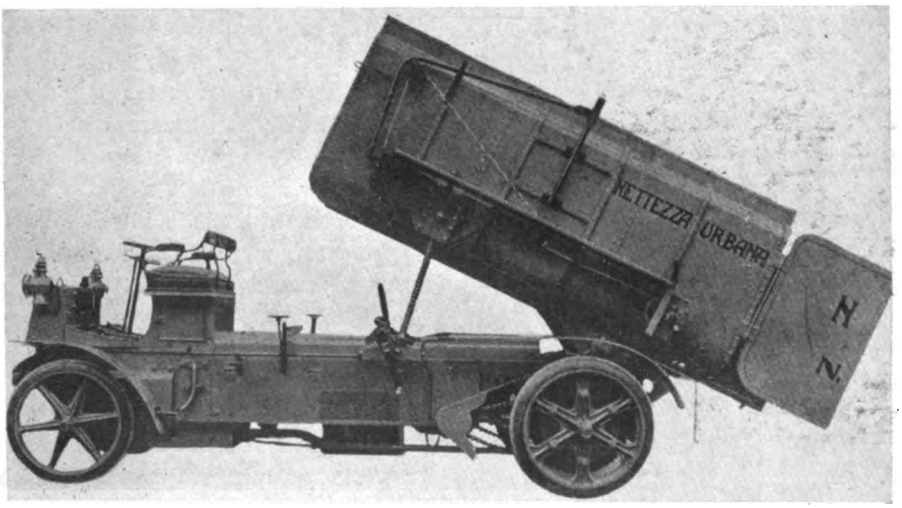
In the case of a new and up-to-date vehicle, the item for repairs and renewals might be fairly taken at $480, the other charges remaining the same.

* * *

Cost of Watering by Motor Sprinkler.

Liverpool employs a motor sprinkler to good advantage. It travels at 6 miles an hour. A horse drawn watering cart only travels at a rate of 1½ miles per hour. Liverpool's one motor sprinkler, therefore, displaces 8 horses and 7 drivers. Working in two shifts of 10 hours each per day, the Liverpool motor water cart covers 35 miles, equal to 656,000 square yards. Eight horses would cover between them 64 miles, but, as they would have to go over the roads twice to water them effectively from side to side, the effective mileage watered would be just half the combined total distance run. Where, as on asphalted roadways, only the gutters are watered, there will be some loss of advantage of width of spread by the motor, but this is negligible because the whole width of the road has to be watered at intervals throughout the day.

On the Liverpool basis of $7.92 per working day of 250 days per year for running and other charges of a power wagon, the cost of watering a mile of 32 feet wide road is 45 cents by power wagon and 55½ cents by horses. The power wagon, owing to its greater load capacity, has to make fewer stoppages at the hydrants for filling, a



Rome's Steel-Bodied Dust Wagon, Tipped.

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process which takes somewhat longer than is required for a horse drawn water tank; but the aggregate time required during the day for filling the power wagon is less than would be required to fill horse drawn sprinklers with water to sprinkle the same area. The power wagon further economizes time by requiring only an average of 10 minutes as against 30 minutes required by horses to run from depot to hydrant for water. Another 20 minutes is also saved by the motor on the return journey, as well as six or seven minutes gained while distributing each load and returning empty.

* * *

How Streets Are Cleaned in Paris.

The Paris motor sprinkler and sweeper has a rotary brush which is carried angularly. Its top half is covered by a hood to prevent the dust from rising. As a further precaution a sprinkler is carried in front of the brush, which dampens the surface of the road. As a still further precaution an additional sprinkler is carried at the rear of the brush. In the body is a 450-gallon water tank. The brush is driven by chain from a countershaft crossing the car angularly beneath the seat. The engine develops 12 hp. It is connected with a three-speed sliding gear transmission. If the brush is not required it can be elevated and thrown out of gear, permitting the machine to serve as a sprinkler. Wood wheels with steel tires are fitted.

* * *

Street Refuse Haulage by Motor.

Unless the water wagon is used all day it is always constructed so that between times it can be used for refuse collection or general haulage. A slip-in tank is usually provided to fit inside the raised boarded sides of the wagon, so that to convert the vehicle for carrying loose material all that is necessary is to lift or draw out the tank. Several motor wagons are so employed in London where the streets are washed every night, regardless of weather conditions.

The success of refuse gathering by motor depends very largely upon the system of collection. It is a thoroughly bad system which does not give a great economy over horses, notwithstanding the numerous stoppages of a power wagon to empty bins and boxes, and the lengthy period necessarily occupied in completing a load. Liverpool and many other British cities use motor vehicles solely for this purpose, and with profit.

Trailer used by Liverpool municipality. Drawbar pull comes upon body of trailer, bar of front wheel carriage being used only for steering.

A motor refuse wagon should have its route arranged so that the total time occupied in running around a district picking up a load and returning to unload, should approach as near as possible the time previously occupied by one of the displaced horse drawn wagons in proceeding to the farthest point of the collection area and returning with a load. Each power wagon should work in concentric circles. In advance a man can proceed along the collection route and bring loaded refuse receptacles into batches of, say, half a dozen in order to lessen the time occupied in loading. The rapid removal of big dust loads by power wagon saves the city of Westminster $1,400 per annum. The advantage of being able to cart away road sweepings from each section of road as it is cleansed is enormous.

* * *

The Multiple Purpose Motor Wagon.

The actual cost per given area of sweeping, watering, and refuse collecting by motor as against the services of horses varies according to local conditions. All experience proves, however, that there are decided advantages to be derived from the use of power wagons for single or multiple purposes. The latter types are particularly successful where there is sufficient of two classes of work to keep a vehicle busy, but insufficient of one class. The multiple-purpose vehicle avoids the necessity of having to stand idle at times. Every hour of work obtained from a power wagon, it need scarcely be said, counts in its favor.

As a rule, seldom less than five horses and as many vehicles or brooms are displaced by a five-ton power wagon in use by British municipalities. Vehicles of this load capacity are most suited for general work and are accordingly extensively used.

The annual charge on a 5-ton gasoline wagon, convertible into a water cart or machine broom, averages $2,112 on a capital outlay of $3,600 for the wagon and $720 for accessories. If used as a dust cart, or for haulage only, the annual charge is about $120 less. A steam wagon of the same load capacity costs about $1,824 annually to run on a capital outlay of $2,400. If used as a machine broom, water cart, or roller, it will cost $120 more annually and an additional initial outlay of $720. The gasoline wagon, it should be noted, does far more and quicker work than the steamer. The annual charges just mentioned include interest at 5 per cent on capital, 15 per cent general depreciation, and cost of fuel, oil, insurance, repairs, wages, etc.

The annual charges on five horsed dust carts, brooms and water carts, displaced by a 5-ton gasoline or steam wagon, is in Great Britain $2,851.20. This amount does not include the cost of keeping reserve horses and stable attendants. Further, in refuse collection and other similar work two men are employed with each horsed wagon, but two, or three at most, are all that are required to

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attend to a motor vehicle which does the rounds formerly requiring 5 horsed carts and 10 men.

* * *

Opinion of a Municipal Expert.

In substantiation of the economy of municipal motor wagons we print this report of the city engineer made three years ago to the corporation of Norwich, England:

The cost of running the motor wagon for a year, including wages, oil, insurance, rent, lighting, repairs and depreciation, is $1,578.64. Ditto for one horse and cart, $521.04. A week's work of the motor wagon when engaged in hauling macadam comprised 340 ton miles; the cost thereof worked out at 8 cents per ton mile. A week's similar work with horse and cart, between the same points, comprises 81½ ton miles at the cost of 12 cents per ton mile.

From these figures it will be seen the cost of haulage with horse and cart is 35 per cent in excess of the same work with our 4-ton motor wagon. With an up-to-date 5-ton motor wagon the total annual cost would be probably less than that of the present 4-ton machine, while its working capacity would be 25 per cent greater. In the case of a 5-ton wagon the cost per ton mile for haulage similar to that herein dealt with will be about 6½ cents, whereas the cost of identical work with horse and cart is 66 per cent greater. If, instead of dealing with the corporation's own horses, a comparison is made with its contract ton mile haulage, which, for the distance in question, works out at 14½ cents per ton mile, the cost thereof will be found cent per cent in excess of haulage with a 5-ton motor wagon, or 20 per cent in excess of the cost with the corporation's men, horses and carts.

For certain work, quite apart from the question of cost, the motor offers very great advantages, notably for the watering of suburban roads. With horse-drawn water carts it is practically impossible to water these roads, the cost being so great in consequence of the length of haul and the comparatively small loads which can be taken.

* * *

Further Expert Testimony.

The economy of municipal motor wagons is further corroborated by this report of the city engineer of the corporation of Westminster, England:

All our vehicles are provided with interchangeable bodies. One wagon was purchased for street watering exclusively. In the case of the other two, the purchase was to enable the house dust of the district, large in quantity, though light in weight, to be speedily removed from the street curbs before ten o'clock in the morning, and, subsequently, by an interchange of bodies to continue in street watering during the rest of the day. As to the advantages to be obtained from the use of motor wagons, much, I believe, depends upon the need for their constant use both day and night. In this case they may reasonably be considered to take the place of three sets of horses during the 24 hours, and, if a motor wagon has a capacity in van loads of six cubic yards, approximately double the size of the ordinary dust vans, with a trailer of a further six cubic yards, making in all 12 cubic yards, it can be seen that under favorable circumstances the use of such a motor day and night would take the place of some 12 horses.

It must be obvious to anyone that the use of a motor wagon stopping at premises where a weekly collection is to be made by shovel and basket, entailing a wait at each place, would be probably a wasteful expenditure of power, but for expeditious collection of house dust from receptacles placed on the curb, or from conveniently accessible positions on private premises the use of the motor wagons offer advantages far beyond those of the ordinary dust cart.

Having been directed particularly to refer to the work done by the motor wagon in street watering, as compared with the horse water van, I beg to report that the capacity of the motor wagon tank is about 860 gallons; that of the horse-drawn wagon about 400 gallons. In traffic the speed of the motor water wagon averages 6 miles per hour, as compared with 2 miles per hour of the horse wagon. I find that, taking into consideration the time saved in the smaller number of occasions for stopping for filling purposes, one of the motor wagons can keep damp as great an area, at least, as two horse-drawn wagons, and in large areas one motor wagon would be equal to three horse wagons.

In accordance with your directions to give the comparative cost of horse power and motor power for municipal work, the following estimate is presented, after an experience of four years' working:

MOTOR WATER WAGON COST PER ANNUM.

Interest on capital, spread over ten years	$ 395.04
Fuel	528.00
Wages, two drivers at $8.88 per week	923.52
Repairs (working night and day)	672.00
Lubrication, etc.	96.00
Insurance	15.36
	$2,629.92

Equivalent to, say, $7.20 per day by motor power for street watering, or for watering, dust collection and flushing. On the modest assumption that a motor street watering wagon is equal to two and a half horse street water carts the cost of the work by horses will be as follows:

HORSE WATER WAGON COST PER ANNUM.

Two shifts of 2½ horses, men and harness (five horses, etc.), at $2.28 per day—per annum	$4,161.00
Interest on capital, etc., of cart at $21.60—say three carts.	64.80
	$4,225.80

Equivalent to, say, $10.56 per day by horse power.

Surely, in view of these well established old-world evidences of economy, it is time American municipalities got busy with motor wagons and discarded their expensive and archaic draft animal equipment.

WAGON FOR ST. LOUIS SALVAGE CORPS.

THE executive committee of the Underwriters Salvage Corps in St. Louis has practically decided to purchase a motor patrol wagon. The machine will be stationed at the house on Locust street, near Channing avenue. This corps covers a very large territory, and frequently makes long runs which exhaust the horses and leave them unfit for service if another call is received.

The recent action of the Western Union in appointing a committee to retrench salvage corps expenses in large cities foreshadows the extensive employment of motor wagons in such service. The St. Louis corps in the past has been credited with making a record for economy. It can add to this reputation by discarding the costly and relatively inefficient horse drawn fire vehicle.

MOTOR FIRE VEHICLE INSTALLATION.

THREE electrically driven fire vehicles, each with a working radius of 20 miles, are operating regularly in service at Charlottenburg, Germany. One is a first-aid engine carrying twelve men; another is an escape, and the third a steam fire engine. In the escape vehicle the power used for propulsion is also employed to raise the ladder. Solid tires are fitted to all three vehicles. All the machines are front wheel driven, the power being derived from storage batteries. The frame of one machine is made of cast iron tubes, which also serve the purpose of water tanks. The batteries give a working radius of 25 miles. The controllers give five forward speeds, one neutral and reverse.

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Concerning "Tested" Motor Cabs

Operators of Foreign Cabs in New York Declare Their Hostility to Untried Machines of American Origin

WHEN may a gasoline motor cab be regarded as satisfactorily tested? A decisive answer is required since the two New York operating companies have seen fit to publicly charge American manufacturers with unreadiness to produce road-tested vehicles as reliable as those obtainable abroad.

The New York Transportation Company leads in the attack. This concern, by the way, was not troubled with any such compunction as it now evinces when, seven years or so ago, it launched its untried electric vehicles upon the streets. None the less it is entitled to a fair hearing in the cause at issue. Its secretary defends the purchase of French machines at twice the price they are sold for abroad by accusing domestic manufacturers of indifference to the entreaties of native buyers. He complains that his company was forced to import $150,000 worth of machines in order to protect the trade it had built up, American makers being either unwilling or unready to help his principals out of the difficulty into which they had fallen after fire had twice caused heavy loss to their electric rolling stock. Now, he avers, this purchase of foreign cabs effectually prevents any reduction of ruling fares, presumably because one-half of the investment is represented not by equipment, but by custom-house receipts. This is a pretty kettle of fish. But let us see what further he has to say upon this interesting subject:

> In the matter of cab building, I think it is admitted that Americans are two years behind their foreign competitors. Two years ago I begged certain makers in this country to turn out motor cabs and try them out in actual service. They seemed to regard the cab market as a doubtful one, and now that the growing demand is fully established they are unable to sell us tested cars. Abroad many makers have had such cabs on the streets from one to two years and you can buy cabs which have a working record. An untested cab is a hazardous investment. Consequently we had to buy $150,000 worth abroad, pay the heavy duties and freight and crating charges, and suffer the long delay in delivery.
>
> These foreign-made cabs are far from ideal for use in America. In the first place, abroad they do not have our snow and ice. In the second place, they are made for trained chauffeurs, who are far more plentiful and less highly paid than are American chauffeurs. Moreover, repair work abroad is so cheap that the makers do not take this into consideration in building. Here labor is high and the repair item on foreign cabs is very important. In France, they do not care if it takes a day and a half of cheap skilled labor simply to repair a transmission, but here such a repair would eat up profits for hundreds of miles of service.
>
> Moreover, many of the parts have to be imported, but even where we make them at home, the replacing of parts is costly. On many new cars we have to begin by putting new rims on the wheels to fit American tires. Yet in spite of these great disadvantages and our consequent wish to get cabs of American design adapted to our labor conditions, we are practically helpless, as almost all American car skill has gone to the development of the pleasure cars.
>
> I hope, however, that American makers will soon wake up to the situation and build and test cars on the streets. If they succeed in making a good American cab they will not lack orders, for the taximeter motor cab is just in the infancy of a great future.

Again we put the question: When may a gasoline motor cab be regarded as satisfactorily tested? When working records are available, if we may take the opinion of the New York Transportation Company's protesting secretary. But will the working records of the first year be the same as those of succeeding years? If the rates of fare, the capitalization, the repair expense account, the volume of business, the high earnings due to novelty as much as utility, and all the other items of accounting remain permanently unchanged, it is reasonable to assume that machines having good service records will sell better than those without them. But experience has shown that the available records of motor cab operation are as changeable as the chameleon. A London company employing less than 500 cabs had a capitalization six months ago 100 per cent less than it is listed at now. Are its early records available for purchasers of similar machines? Its earnings have not increased in proportion as its securities. In Paris, birthplace of the gasoline motor cab, so many tariffs prevail that a service record is practically valueless if an attempt is made to use it as a basis for investment.

* * *

The truth is there is no reliable information extant concerning gasoline motor cab operation which can be utilized to insure profits for investors. There are no thoroughly tested motor cabs in the world, in the sense that they can be guaranteed to make money for their operators. It is not known if the machine with a four-cylinder engine is any more economical than one fitted with a two-cylinder motor, or a one-lunger. There are plenty of engineers who will stake their reputations that a friction driven cab is less expensive to maintain than one equipped with sliding gear transmission. The latest development in Paris cab circles is the gasoline-electric machine, which is virginal in innocence of recorded performance.

And so it goes. There is no standard of purchase. The cabs imported by the New York Transportation Company were not tried in service one hour before they were publicly employed abroad in large numbers. It was assumed they could travel. They did so. The touring car design from which they were adapted was in successful operation. That was enough for the producing engineers. Incidentally it was all the cab proprietors wanted to know. The rest was merely a matter of mathematics and the procuration of the public's sympathy for a new form of minor transportation.

Motor cabs that make money for their owners are not necessarily those which have the endorsement of company promoters. The newly designed machine may very well be, and likely is, greatly superior to one which has been on the market for years. Constructors profit by experience.

* * *

The sentiments expressed by the secretary of the New York Transportation Company are heartily echoed by the president of the New York Taxicab Company, which

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organization also operates French cabs. The charges made by this second critic of American manufacturing dilatoriness are a little more pronounced than those already quoted. From him we learn that even if American makers were in position to make deliveries of gasoline cabs the company would not accept them, there being no tangible evidence to support whatever claims might be made for their behavior in service. The Taxicab company's opinion in the matter is here given:

Much as we would like to patronize American manufacturers we could not take the risk of buying untried cabs even if the local makers were in a position to deliver the quantities required. It is altogether too dangerous from a business standpoint to take the risk of buying cabs that might not stand up under the hard usage we would give them. Before buying the cars we are now using, we tested several of them for as much as two years and had the benefit of seeing them in actual service in large quantities for an extended period. Every American cab offered to us so far has been purely an experimental affair, with no record of actual performance behind it. Just think of it, a great many of our cabs go between eighty and ninety miles a day right along, without repairs of any kind and in the hands of all kinds of drivers. When American makers can show us actual record of that kind, then we will be ready to talk about buying.

The sincerity of these remarks may well be doubted. It is more than likely that they were inspired by a natural desire to protect present investment in a market which has been temporarily laid open to invasion by foreign makers, but which will soon be disputed by Americans determined to dispossess the products of the invaders. It is safe to reiterate the statement that when American makers can show working records New York cab proprietors will cease importing machines. It is even probable that before the records are available the suggested trading relations will be established.

Of course, there is a reason for this opinion. It is partly found in the declared intention of the largest of the London cab companies, using nothing but French machines at present, to install a large number of British made vehicles at an early date. Not service tried British cabs, mind you, but a design fresh from the shop. This company has had considerably more experience with French cabs than either of the New York concerns, and yet it is desirous of doing the very thing they both declare to be so risky. The threat of native machine competition may have been potent in producing this change of policy, although it is reasonably certain that half a million dollars would not be ordered expended merely for the sake of standing off competition if it was suspected the product to be used was unreliable.

* * *

For the benefit of all and sundry who vainly imagine that the durability of French motor cabs is beyond compare, and that their bare cost of operation is as low as it is possible for engineering talent to contrive, it may be well to remark that there are in this country light models which at every point of profitable comparison can safely be depended upon to back the foreign machines off the streets. True, these American machines have not been strictly designed for public service, but they can be converted as readily as were the French models which, as all know, are merely rearranged runabouts or touring cars.

It begins to appear that a conspiracy exists to belittle American efforts to secure control of our own markets. The futility of such behavior must be apparent to anyone who knows how firm is the resolve of American makers to supplant the foreign cab equipment which now has a monopoly of New York's patronage. American agents of French capital and industry may bellow as loud as they please about the value of working records, but they will sing small when the American cab gets into action, as it will presently.

ELECTRIC STREET WASHER.

AN ELECTRICALLY operated street washer, the only vehicle of its kind in existence, was recently put to work in Berlin. A 40-cell battery taking a charge of 36 amperes is located in the fore part of the machine. Two motors, each developing 4 h.p., drive the front wheels and give a speed of 7 miles an hour. The controller gives five forward speeds. One battery charge is sufficient for 15 hours' work. The machine carries 400 gallons of water and under ordinary conditions cleans a little more than twice the street area a horse drawn street washer will clean under similar conditions. The water is under hydraulic pressure. A trailing rubber brush is operated by chain and sprockets from one of the rear wheels.

The railroad service between Hope and Columbus, Ind., being very inadequate, a company is being formed to operate motor buses between the two points.

Hourly motor bus service has been commenced between a Plainfield and Piscataway, N. J. The two towns are three miles apart.

A story going the rounds of the press credits a youthful Dakota farm hand, having an undeveloped taste for mechanics, with inventing a motor thresher and refusing $100,000 for the exclusive right of manufacture under patents. A couple of years from date it will be in order to reprint the story, omitting two or more of the inconsequent ciphers.

A contractor in Budapest has offered to supply the municipality with three motor wagons without cost, and operate them for a year, in order to demonstrate their superiority in dust collecting, street watering and general city transportation.

The Merchants' Auto Transportation Company has been formed in New York City with capital stock of $500,000 to do a general merchandise delivery business.

The board of aldermen in Willimansett, Mass., favor the purchase of a motor fire truck to cost $6,500. The bill authorizing its installation has passed its first reading.

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MOTOR WAGONS FOR THE U. S. ARMY.

WORD comes from Washington that the army authorities are again about to take an active interest in the use of motor wagons for transport service. It is semi-officially announced that the efficiency of motor driven vehicles is to be tested under conditions which will approximate actual field service, hilly country, bad roads and remoteness from fuel supplies being prescribed for the experiment.

This is evidently the result of the quartermaster general's conviction that the time has arrived to prove that in the bulk of transport motor wagons are superior to draft animals both from a military and economic viewpoint. In this opinion he is well sustained by the recorded experience of European army executives, expressed and analyzed in another part of this issue.

CARELESS DRIVING.

NOT only is it a wilful risk of valuable property to drive a motor truck over street car rails in crowded traffic, particularly in slippery weather when brakes do not act promptly, but it is even unsafe to drive in close proximity to the rails if there are any fixed obstructions in the thoroughfare.

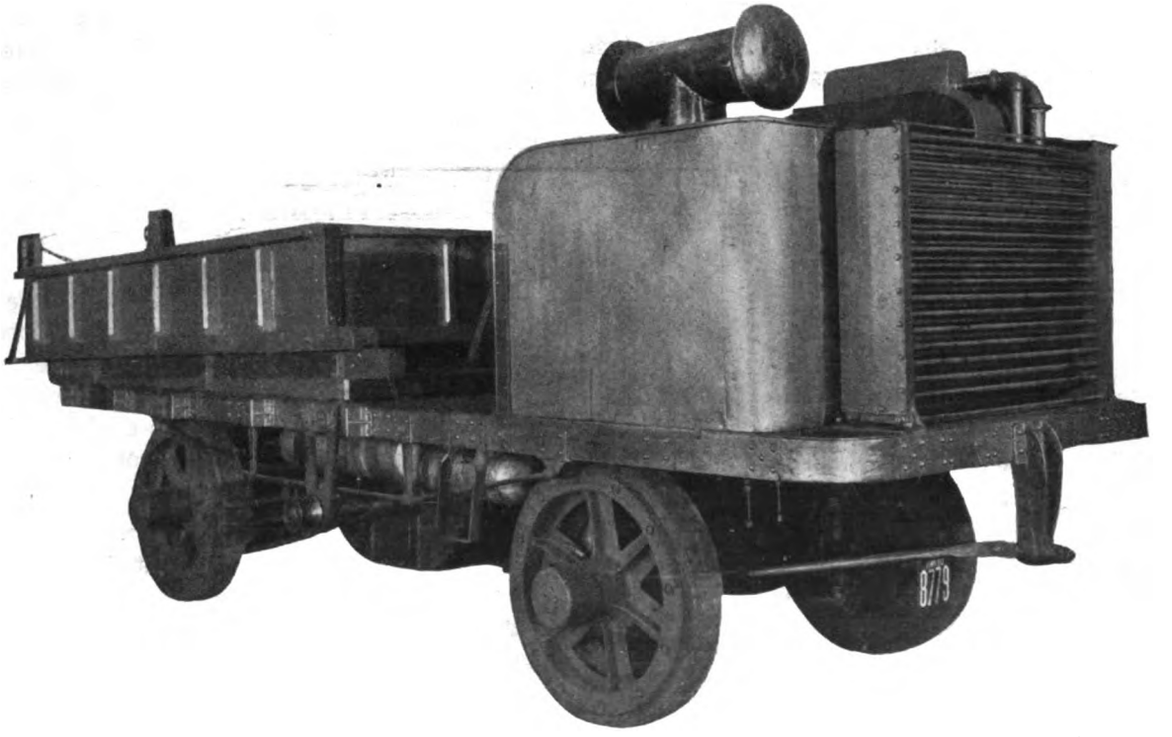
The driver of a machine in New York was unable to clear one of the pillars of the elevated railway in time to avoid collision with a surface car, and the impact wrecked his vehicle. Motor wagon drivers should be instructed by their employers that the risks of traffic are not lessened because they operate a handy, short and speedy vehicle. These very qualities may well serve to make drivers overconfident of their ability to extricate their machines from difficult positions. Judgment in the selection of a course to be steered is the most important qualification for successful driving.

LESSON OF A DISASTROUS FIRE.

IT IS comparatively easy to be wise after the fact. A disastrous fire among the elevators and grain warehouses at Superior and Duluth has started an inquiry touching the value of the present fire department equipment of these two cities at the head of the great lakes.

From the evidence it appears that much of the loss could have been avoided if the fire fighting apparatus had been mounted on motor propelled vehicles. The time lost in reaching the scene of the conflagration—a loss chargeable to the inefficiency of draft animals—is the sole topic of discussion in insurance and commercial circles. Property worth millions of dollars was apparently destroyed because the element of speed was lacking in getting the fire fighting appliances into action.

The railroad yards at Superior-Duluth being among the largest in the world, it has been proposed that in the future any motor vehicles which are designed for fire department duty be equipped with flanged wheels so that they may run upon the tracks.



Ten-ton Steam Truck for Hauling Bricks.

Considering the splendid economy shown by the heavy steam wagon in England and Europe during the past seven years, it is rather surprising to observe that this type of industrial motor vehicle should be so little used and known on this continent. The load capacity of the truck shown above is from 8 to 10 tons. The machine, made by the Pittsburg Machine Tool Company, is fitted with a dumping body and is intended to carry bricks. The power plant is a three-cylinder, single-acting engine and fire-tube boiler. The transmission is by gear and chain, the engine being direct connected by shaft to the transmission gearing, which is encased in steel under the truck. The truck is equipped with two brakes, a hand brake working on the rear wheels and an air brake working on the brake drum on the differential. There are two speeds for the transmission. The vehicle is equipped with condenser and necessary air pumps, tanks, etc. The wheels are steel castings, furnished with wooden tires. There is also a steam driven winding drum which is keyed to the shaft projecting beyond the side of the truck, which is intended for hoisting, etc. The frame is made of riveted channels, the top plate being ¼ inch steel. Stake pockets are riveted along the outside of the frame.

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CHICAGO TESTS MOTOR FIRE APPARATUS.

DURING the past month the Chicago fire department has been constantly demonstrating the service efficiency of a motor driven combination hose and chemical wagon. The machine, which has an air cooled gasoline engine developing 40 h.p., has at various times been placed at nearly all of the more important stations, and despite the heavy snow and bad traction conditions has easily established its superiority to horse drawn vehicles in the same service. Its speed is, of course, its greatest advantage, 40 miles an hour being attained when necessary.

Wherever the machine may happen to be located it is expected to respond to fire alarms, just as though it were part of the regularly commissioned municipal equipment. Naturally it is always first at the scene of every fire within the territory assigned to its station. In consequence of these early arrivals and the good work its crew is enabled to perform before other apparatus can be got into action, the fire department places a high value upon its services.

The chief purpose of the test has been to establish the reliability of the machine. This has been accomplished. To ascertain the economy of motor driven fire apparatus is the next step. An examination of the records of other cities which have used self-propelled apparatus for some years past should be more useful than speculation based upon brief experience with a single unit. It is easy to show that there is considerable economy in partial conversion of present apparatus, but there is an enormous saving to be effected by total conversion.

HORSE CAB RATES FORCED DOWN.

THE taximeter cab has accomplished many things for which New Yorkers have occasion to be thankful. In addition to ushering in the era of cheap, rapid and satisfactory cab service, it has forced horse cab proprietors to recognize the inferiority of the service they have been in the habit of supplying. In the hope of saving the remnants of their rapidly decreasing patronage the horse cab owners are considering a heavy reduction in fares and the employment of the taximeter.

If this is the result of the introduction of less than 500 taximeter motor cabs it is absolutely certain that horse cab investment will be annihilated before many moons have passed, for the new public service vehicle has as yet barely done more than make its bow.

An indication of the usefulness and permanence of the motor mail wagon is found in the issue of a new postage stamp, current in two European countries, on the face of which the picture of a machine is prominently displayed

Hot water circulation has been provided for the comfort of passengers in the interior of Paris motor buses.

In a new design of motor bus body of single deck type half of the space is open for those who want to smoke or enjoy the air. In order that pedestrians may not be splashed with mud the wheels of the vehicle are run under a curved metal cover which reaches close to the ground.

MOTOR CAB RIVALRY IN CHICAGO.

ALL sorts of motor cab schemes are being developed in Chicago these days. The announcement of maturing plans by the Taximeter Motor Cab Company, which is scheduled to put Cadillac machines in service, was quickly followed by declarations of intention from the Orlando Weber Taximeter Cab Company, incorporated to operate Renault machines of 20 hp.

Both these concerns are as yet in process of organization. It is understood that individual members of the Cadillac company of Detroit are interested in the enterprise of the Taximeter Motor Cab Company, but not to such an extent as to dominate its policy. The company is the creation of C. H. Foster, the Cadillac agent in Chicago. It is to be presumed that the Weber Company is tributary to the New York company which has been formed for the purpose of exploiting Renault cabs in this country. If this is the fact it will be some time before many of these French machines will be seen in Chicago, for the New York concern is not meeting with the best of luck in importing cabs for use on the streets of the metropolis.

The Cadillac cab will weigh 1,600 pounds and seat four passengers. Power will be furnished by a single cylinder 10 hp. engine. Wheels will be fitted with 30 by 4 inch pneumatic tires. It is calculated that each machine will cover 75 miles daily, 30 of which will be unremunerative. New York motor cab rates will be charged. The south side of the city will be chosen as the scene for early operations. The garage will likely be located at Twenty-second street. Very low operating and maintenance charges are claimed for these machines. It is said that one cent a mile will cover all costs exclusive of drivers' wages and administrative expense.

AMERICAN PRODUCTS ABROAD.

THREE American steam police patrol wagons have been shipped to Brazil. Five American steamers are carrying mails in the island of Java. Twenty-nine more steam driven machines are operating as buses in Osaka, Japan. Gasoline and electric industrial machines of American origin are operating in Cuba, Finland, London, Honolulu, Rio Janeiro, and many other remote spots of the world, indicating how universally is the demand for our products.

In Berlin there are fixed stopping places for motor buses. A metal post, bearing an arm with a sign painted on it, indicates to the wayfarer where passage can be taken.

The maker of a motor cab in service in London has challenged a rival manufacturer to a test of superiority in a race of fifty miles through the streets. The winner is to show that his vehicle can be operated with less fuel and with fewer changes of gear than the cab of his competitor.

The Webb Motor Fire Apparatus Company has been formed in Joplin, Mo., with a capital stock of $300,000 to manufacture gasoline propelled fire vehicles.

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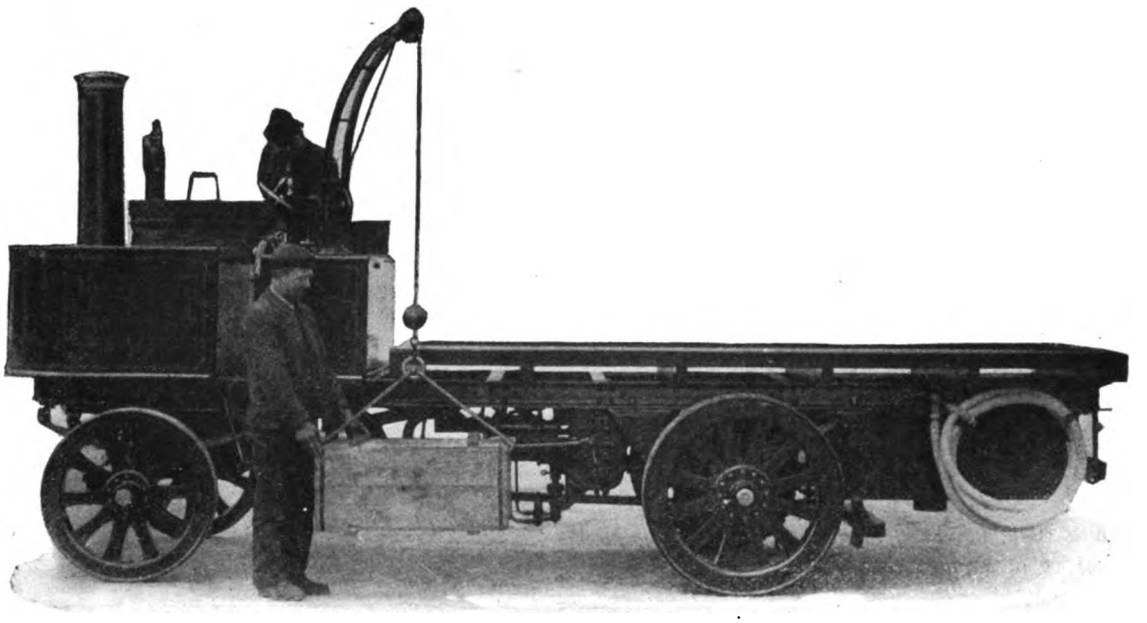

Military Steam Wagon with Jib Crane.

Military Motor Vehicles

Critical Study by an Expert of Their Importance Both in Times of Peace and War

THE work of thirty-four motor wagons hired to transport food supplies for the commissariat department during the fall maneuevers of the French army was so consistent as to compel even the most stubborn opponents to concede their superiority to draft animal service. These machines, few as they were in number, actually hauled the food supplies for an army corps, and thus demonstrated the economy as well as the utility of the motor vehicle in military transport.

Bordeaux was the center of provisioning, and every evening the chief in command of the corps received a telegram which indicated the points of victualling for the next day and the quantity of supplies to be forwarded. The motor wagons, which were furnished by seventeen manufacturing firms, were loaded with provisions for the troops, forage for the cavalry horses and munitions, and set out upon their trips as soon as orders were received from headquarters. They started at an early hour each morning, moving in sections under convoy, and occasionally the lighter wagons covered between 85 and 95 miles on a single journey. Some of the machines used gasoline for fuel, some alcohol, and others a mixture of alcohol and naphtha. Steamers were also employed. Speeds varied from 12 to 15 miles per hour. At the conclusion of the maneuvers the wagons were shipped back to their owners by special train.

* * *

Thirty-four Machines Do the Work of 150 Horse Wagons.

The remarkable superiority of motor wagons in military transport of this character is well shown by the fact that the thirty-four machines employed took the place of 150 horse-drawn service wagons. This substitution made the services of about 100 non-combatants (horse wagon drivers) unnecessary Very little imagination is required to perceive how great would be the economy if a whole army, instead of a single corps, obtained its provisions and munitions through the agency of the motor wagon. Though many of the journeys were performed on roads which are famous for their smoothness and the good condition in which they are maintained, still there were numerous occasions when the machines, in obedience to orders, had to cross prairie lands and fields, and climb steep grades. The demonstration was something more than a fair weather test of the motor wagon's ability. It did not give the machine any chance to escape duty which is regularly assigned to horse-drawn service carts. One day in each week of the maneuvers the operators of the machines were given an opportunity to overhaul, repair and adjust The pay for the use of the machines was fixed at 17 cents per horse-power per day, fuel, lubricating oil and grease being supplied from the army stores.

* * *

A Day's Work for a Commissariat Motor Wagon.

At the commencement of the maneuvers the vehicles were divided into two classes. At daybreak one division set out from Bordeaux loaded with provisions to be delivered at camps within a radius of seventy miles. Traveling at a speed of from seven to ten miles an hour, the provisions could not be discharged before the afternoon. The convoy would reach some town or village about twenty miles from their base, and pass the night there. The next morning an early start would be made for Bordeaux, that city being entered about noon. After the trucks had been loaded each would proceed to the military garage, where the drivers would examine their vehicles preparatory for an early morning start the next day. This program

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brought twenty wagon loads of provisions to the fighting line each day. The two divisions were subdivided into classes according to the average speed they were able to maintain, and an officer was placed in charge of each.

The French army now owns a small fleet of motor wagons, chiefly composed of those which won honors in the recent 2,500 mile reliability trial. They are operated by picked men from the automobile army corps. It is expected that as a result of the splendid work accomplished by the machines loaned to the commissariat department another and more considerable purchase will soon be authorized.

* * *

French military experts have long been studying the value of the automobile in warfare. One of them, Captain Girardault, writing in "Le Poids Lourd," considers its technical importance in the carrying of provisions and stores. The inferences he draws concerning its usefulness and economy are full of interest, particularly for those who have occasion to speculate upon the advantages to be derived from the supersession of large numbers of horses and wagons He points out that the organization of the commissary department has always been considered a problem in the army. It would be easy to cite many examples in history of the onward march of combatants arrested by lack of provisions.

The enormous masses of troops employed in modern warfare only aggravates the difficulties of the problem. Nowadays military transportation must be rapid, flexible and efficient. For each army corps on a war footing we have the following:

Transports for provisions	4.13 miles	93 mins.
One field bakery	.37 miles	7 mins.
Transports for above	.62 miles	12 mins.
One drove of cattle (100 head)	.06 miles	1 mins.
Total	5.18 miles	1 hr., 53 mins.

We must, therefore, count on more than 5 miles of transports for providing food for a single corps and compute the time necessary for the passage of a given point at almost 2 hours. This makes for an army of four corps a line of transports 20 miles long passing in 8 hours.

* * *

The Advantages of Mechanical Traction.

The advantages which would result from the employment of mechanical traction for the transports are:

1—Speed.

2—Diminution in the length of lines.

3—Increase in the radius of action.

4—Flexibility.

SPEED: No one doubts the superiority of mechanical traction from the standpoint of speed. But it would be unwise to go too far in this direction. It seems that in the contests for commercial vehicles which have been held in France up to the present time, little attention has been given to the risks taken with a vehicle weighing from 5 to 8 tons and traveling at speeds varying from 19 to 25 miles per hour. In time of war extraordinary speeds are unnecessary for the transportation of provisions. But there is one consideration which rises above all others; it is the certainty of having the commissariat wagons arrive when they may be needed. The risk of never arriving at all is greater than the pleasure of arriving a half hour too soon.

A speed of 7½ to 9½ miles per hour for trucks weighing 6 to 7 tons should never be exceeded This would be more than double the present speed of horse-drawn transports. All that could be gained in the way of speed would be at the expense of higher operating cost and greater wear and tear.

* * *

Comparison of Column Formations.

DIMINUTION OF THE LENGTH OF LINES: The average space taken up by a horse-drawn vehicle in a column is 39 feet. A horse-drawn truck carries from 1,760 to 3,520 lbs., according to size. An automobile takes up 19½ feet, intervals included. There are several motor trucks on the market capable of carrying at full load a total weight of 5.10 or even 12 tons. Even the heaviest of these could be used during a campaign, but it would not be prudent to use such heavy machines since, on account of the heavy traffic, the roads would not long remain in good condition. Therefore the total weight of a military truck should not exceed 12,100 to 13,200 lbs., of which 6,600 to 7,700 lbs. should be useful load. These figures, though moderate, are sufficient to prove the advantages of mechanical traction. The number of motor vehicles would be 66 2-3 per cent less than the number of horse-drawn vehicles required for the same service, while the length of columns would be reduced about 80 per cent.

To supply an army composed of four corps and two divisions of cavalry requires the daily transportation of 585 tons of provisions, to which must be added 60 tons of provisions for the men and horses for the transports. Supposing that the army had a distance of 85 miles to travel, each day's journey being 22 miles, the transportation of provisions would require 4,050 wagons, 8,100 horses and 4,900 drivers. This is calculated on a basis of an uninterrupted series of wagons, each of them carrying a load of one ton, which would be its maximum capacity. If we figure on average load we must count on 5,200 wagons, 10,400 horses and 5,200 men. If motor trucks were used instead of horse-drawn wagons the same service would be given by 800 motor vehicles and 2,400 men. The use of the automobile would allow, besides the total supersession of the horses, reduction of 50 per cent in the number of men needed.

* * *

Radius of Action and Flexibility.

INCREASE IN THE RADIUS OF ACTION: In some cases it may be advisable to keep a certain amount of territory free from incumbrances immediately in the rear of the zone of active operations. With the automobile the space between the army and its source of supplies may be twice as great as with horse-drawn wagons, and since the speed of the former is at least double that of the latter the transports will take no longer to come up to the army

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when necessary. Should it be necessary to leave the direct road open the transports can make a detour, since the radius of action is 60 to 75 miles, or even more.

FLEXIBILITY: The flexibility of a column consists in its ability to vary its speed or formation. It is incontestable that the average speed of a motor wagon is at the disposition of the driver. In case of need, therefore, speed may be increased to more than four times the maximum speed of a horse-drawn vehicle. The flexibility of formation is an immediate result of the smaller space taken up on the road and ease of direction. The choice of a stopping place, so difficult with horse-drawn transports, becomes extremely simple with the automobile. The reduction in the number of men needed is an advantage which should not be lost to view. The supplies for an automobile consist of gasoline and oil, commodities easy to transport and taking up far less room than hay, straw and oats for several thousand horses.

A question which requires study is whether it would not be more advantageous to employ tractors than motor trucks. In 1902 the Bavarian artillery decided in favor of the tractor, because, as was said at the time, the automobile had not then been sufficiently improved. The advantages of a tractor and trailer transportation consists in its great capacity and the reduction in the number of skilled mechanics needed. In the field both the tractor and the motor truck could be employed to advantage, the tractors being used in place of the heavy trucks carrying 5 tons or more.

* * *

Specifications for an Army Truck.

The following are about the proper specifications for a French army truck for the transportation of bread, meat, and the lighter food stuffs:

Motor, 16 hp.
Carrying capacity, 6,600 lbs.
Dead weight, 5,500 lbs.
Total length, 19½ feet.
Width of platform, 6½ feet.
Average speed, 7½ miles per hour.
Maximum speed, 10 miles per hour.
Minimum speed, 14% grade, 2 miles per hour.

There is nothing absolute about these figures. It is quite possible that this truck would be less efficient than the 4 or 5-ton truck for commercial purposes, but we are interested solely in the conditions met with in time of war.

In Austria comparative tests of tractors and motor trucks were made during the maneuvers of 1906. The first corps was supplied with four motor trucks, three for the transportation of provisions and the fourth for ammunition. Three other corps were provided with tractors, one of which was fitted with four-wheel drive capable of hauling two or three wagons. Each tractor hauled from 5 to 8 tons per wagon, and the daily trips were as high as 62 miles. Each tractor was accompanied by a motor tricycle, which enabled the transport vehicles to keep up communication and to readily arrange for stopping places for the night.

Four Distinct Uses for Army Motor Vehicles.

There are four distinct ways in which the automobile can be used in time of war. They are as follows:

1—For rapid transportation of officers or detachments of soldiers.

2.—For carrying messages and orders.

3.—For transporting ammunition and supplies.

4.—For transporting small rapid fire guns.

RAPID TRANSPORTATION: The great changes in armament and the constitution of an army show the necessity for supplying means for rapid transportation on the battlefield to those who are in command. The increase in the size of armies, and increased carrying power of modern weapons, have had for immediate consequences the extension of the battlefield. There is no longer a single battle between large bodies of troops, but a series of battles fought simultaneously over a space 30, 40 or even 50 miles in length. During the Russo-Janapese war, although the country was almost entirely devoid of roads suitable for modern mechanical traction, the military operations were such as to enable us to form an idea of what may be the role of the automobile in warfare conducted in our own and other countries.

* * *

The Length of Modern Battlefields.

One of the most striking things about the Russo-Japanese war was the length of the battle fields. Following is the length of the line of battle during the principal engagements in Manchuria:

Liao Yang, Sept. 2, 43.5 miles.
Cha Ho, Oct. 9-18, 46.6 miles.
Mukden, Feb. 29, 49.7 miles.

We can no longer depend upon the horse to carry us across the battlefield. The time is long past when the general-in-chief could watch the conflict and see the decisive moment when a final attack would mean victory. And yet it is said: "It is the general-in-chief who should seize the propitious moment when every effort should be concentrated for the decisive attack." Now, if the general in command is not in constant communication with the corps commanders, if he cannot go wherever and whenever his presence is necessary, his decision will not be based on sufficiently certain information, because he cannot judge of the real importance of information conveyed to him concerning the condition of the enemy. It is now, thanks to the automobile, possible for a commanding general and his chief of staff to visit two or more army corps during a single day, making a tour of inspection covering 85 or 100 miles and see for himself the actual state of his troops. If a general wishes, before a battle, to summon one or several commanders to a council, what should transport them a distance of 25 or 30 miles but an automobile? The telegraph and telephone permitted Marshal Oyama to direct the battle of Mukden, and the old Japanese warrior so well understood the uselessness of his horses that he made no use whatever of them during the engagement. If the field had been suitable for the use of the automobile he would have had at his disposal a means of consulting with his

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generals otherwise than at the end of a telephone wire, which might be broken.

* * *

Indispensable to the General's Staff.

But the automobile is not alone indispensable to the commander; it is also indispensable to his staff. Much time and energy is spent in riding on horseback over hard and dusty roads. Using the automobile not only is time saved, but staff-officers arrive at the end of day's journey fresh and ready for work. They can even read, look over maps, or discuss plans while en route, and on their arrival at the end of the journey can write out their plans or orders.

There are occasions when it is important to transport officers or men over a long distance as quickly as possible, especially where rapidity of execution is one of the conditions essential to success. Twenty men commanded by an officer of engineers, carrying 500 pounds of melinite, would be able to destroy the greatest of structures in a few hours. It is seldom that they would be unable to approach close to the scene of operations in an automobile. Another case: A railroad bridge has been destroyed; to rebuild it requires several weeks; the bridge is indispensable, and it is decided to reconstruct it. But the surveyors are 125 miles away, and it is impossible, owing to incumbrances on the road, or for any other reason, to transport them and their instruments by railroad. A single automobile will do the work in ten hours. War alone would show the innumerable uses to which the automobile could be applied in the field.

* * *

Keeping Up the Supply of Provisions.

To understand the use to which the automobile could be put in the army it is necessary to understand the service of its different sections, artillery, engineers, Red Cross, signal corps, rear guard, etc. At the beginning of a war a line is fixed between the territory placed under the orders of the commander-in-chief, called the war zone, and the territory remaining under the authority of the war minister, called the interior zone. The rear guard is supposed to maintain a line of communication between the army and the home government. This line extends over both the army zone and the interior zone, and may include both railways and roads and highways. This department consists of two great divisions, the railway section and the highway section, organized by the army and including everything not directly connected with the transportation by rail. The principal object of this department is to keep up the supply of provisions.

* * *

Transporting Ammunition Supplies.

ARTILLERY MOTOR WAGONS.—To the artillery is delegated the task of supplying the army (both artillery and infantry) with arms and ammunition. This is not one of the least of the difficulties imposed by war, in view of the enormous amount of ammunition required. According to observations made in Manchuria, the question of keeping up the supply of ammunition has become a problem of the greatest importance. The modern army needs more ammunition than can be furnished it with the means of transportation employed up to the present time. Regiments of infantry and batteries of artillery ran out of ammunition on the field of battle in Manchuria, on both the Russian and Japanese sides, in spite of unheard of efforts made to keep up the supply of cartridges and shot. An automobile intended for transportation of ammunition should be able to travel on any kind of road. A truck with a carrying capacity of two or three tons seems to be the proper thing for the artillery.

* * *

Machines for the Engineer's Corps.

ENGINEERS' MOTOR WAGONS.—Among the duties of the engineers the following may be noted.

1.—Transportation of tools and material.

2.—Operation of telegraph system.

The transportation of tools requires at times a special degree of rapidity, and a few thousand picks and shovels at the proper time and place may be of as much importance as the arrival of several tons of cartridges. During the war in the Transvaal fifteen tractors and two steam ploughs were put in service. The ploughs were used for digging trenches, only a small amount of work with the shovel being necessary to finish them up. The tractors proved very satisfactory, often rendering services for which they were not intended, pulling wagons out of bad spots and helping the oxen to haul provisions and ammunition. Lord Roberts called attention in his reports to the service rendered by these machines and asked that the number be increased. He suggested that in place of coal, a liquid fuel be used, which for the same quantity of energy produced would occupy a smaller space.

* * *

Signal Corps Motor Vehicles.

The installation of a telegraph system is a line of work in which the automobile can be used to the greatest advantage. One of the problems which is in need of a solution is that of running a telegraphic line in the minimum amount of time. At the present time the speed attained is about 2 1-2 miles per hour, but with new means of locomotion it is possible, as experience has proven, to attain much greater speed. For repairing lines and re-establishing communication the advantages resulting from the use of the motor-cycle or the motor-car may at times be enormous. Should a line be broken while the commander is in communication with some of his officers, the chief telegrapher is notified. He at once sends out a car carrying one or two men, a few tools, and a couple of reels of wire Although the break may be 12 or 18 miles away, it would take hardly more than an hour to find and repair it.

The motor-cycle for telegraphic purposes has been officially adopted in the Austrian army. To an ordinary motor-cycle has been added a third wheel, a second seat being mounted next to the driver's seat. The man who is to lay the wire sits on this second seat and manipulates the wire by means of a long bamboo pole. The reel of wire is fixed before him, and it unrolls as they go along. Each of these motor-cycles carries 1 1-4 miles of wire. With one machine for every 1 1-4 miles the different sec-

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tions of a line may be laid simultaneously with great rapidity. Tests during maneuvers in 1906 showed that the use of these machines permitted the laying of 2 1-2 miles of line in 12 minutes. Experiments have been made with wireless telegraphy in the field, but the problem is one of great difficulty, owing to the delicacy of the instruments and the care which is necessary with them. In 1906 an automobile for wireless telegraphy was given a trial. This car also contained an X-ray apparatus and a searchlight. The idea of having a car for several entirely different kinds of work did not work out well. If the army is to be supplied with such cars they should be either for wireless telegraphy or for X-rays. During the Russo-Japanese war, both Russians and Japanese put the wireless telegraph to good use.

* * *

Motor Wagons in the German Maneuvers.

At this moment the German war office is deeply interested in the daily performance of motor road trains, tractors, wagons and buses which are engaged in doing work at the fall maneuvers. The motor vehicles are divided into two columns, one doing light transportation work and the other heavy work.

The heavy column, which hauls about 55 1-2 tons daily, consists of a gasoline-electric train having five trailers with a total carrying capacity of 13 1-2 tons; two steam road trains, each having four trailers and a total capacity of 13 1-2 tons; a steam road train, having two trailers and a load capacity of 10 tons; and another steam train having one trailer and load capacity of 5 tons. A tractor and trailer fitted with supplies and machinery for effecting quick repairs accompanies this column.

The light motor vehicle column is composed as follows: two tractors, each drawing three trailers having a load capacity of 8 tons, the tractors being driven on all four wheels and fitted with 6-cylinder engines; six tractors, each drawing two trailers having a load capacity of 6 tons; two steam wagons, each pulling one trailer and having a load capacity of 6 tons; one steam wagon drawing one trailer and having a load capacity of 5 tons; and one gasoline tractor with one trailer fitted as a traveling repair shop. Four gasoline motor lorries, with load capacity varying from 3 to 3 1-2 tons, are also attached to the light column.

A motor bus, capable of transporting twenty-seven men, is occasionally employed for the rapid transportation of fuel. Motor cars, motor-cycles and light delivery wagons complete the motor vehicle equipment.

Altogether there are 32 motor vehicles of one kind and another employed in the maneuvers. The motor tractors and motor road trains haul 39 trailers. Every day the vehicles in the heavy column cover from 20 to 40 miles. The light column vehicles cover between 40 and 70 miles a day. The performance of the road trains is being watched with more than ordinary interest owing to the fact that the maneuvers are being held in a mountainous region.

Correspondence

Good Administrative Capacity Is Required.

To the Editor.—I was very much interested in the letter of complaint from a flour milling concern, recently published in your paper, in which it was stated that the firm had abandoned its 5-ton electric trucks because it was found they could not be operated as cheaply as horse drawn wagons.

My experience with motor vehicles of the same rating and, I assume, the same manufacture, is so much at variance with that of the firm in question that I cannot refrain from giving it to you in order that prospective purchasers of such machines may not be led astray concerning their economy. We have been using a large number of motor trucks for the last two years. We find them satisfactory and perferable to horse drawn vehicles. While the cost per truck is higher in the case of motor vehicles, yet from the fact that we get more milage and speed, and carry heavier loads, we figure true economy in the use of our machines. We also figure as an important item the saving of room in the barn, on the streets, and when loading and unloading.

We are using for general city work some thirty-five electric trucks of various capacity and manufacture. Some of these are one and one-half, three and five-ton machines. We are also using three gasoline trucks where considerable mileage is required.

Our experience leads us to say that the proper maintenace of power trucks is of the utmost importance. In fact, unless proper maintenance facilities, equipment and system are provided they will not prove a commercial success.

A Subscriber.

New York City.

Somebody Should Be Discharged.

To the Editor.—It is a sign of administrative weakness for a concern to advertise its inability to compel its operatives to attend to duties which other concerns succeed in having performed without much trouble.

Lang & Co. say they cannot make their five-ton electric trucks pay. Does that prove anything but administrative incapacity on their part? For five years we have been using electric motor trucks, three and one-half years of which we have had a five-ton electric truck which has given us the best satisfaction, being out of commission less than the others.

We find the cost of motor truck haulage as compared to the service of horse drawn vehicles, slightly less, but the service we can render our city customers through more prompt delivery is quite a coinsideration.

The conditions in this city, as you are no doubt aware, are the most severe in the country owing to the grades we have to contend with, and we have no doubt whatever that our machines would do at least 33 1-3 per cent more work in New York or other relatively level cities.

Our only objection to the electric machine is its lack of radius. For making extra long trips we are using gasoline machines.

If Lang & Co. cannot accomplish what others are accomplishing with electric trucks they should fire their stable executives. It is ridiculous to blame a useful business instrument for the faults of those in control of it.

Electric.

Pittsburg.

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HOSTILITY TO CHAIN WRAPPED TIRES.

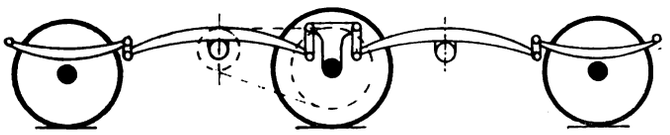
LAST month an order was issued by the department of parks in New York City prohibiting the traffic of automobiles of all kinds equipped with tire chains over the roads and streets under its jurisdiction. The manifest purpose of this order is to preserve the traffic surfaces from the wear caused by the attrition of steel chains.

Admitting the wisdom of this precaution one is puzzled to account for the exclusiveness of its application. Why is the measure solely directed against automobiles? Is the rolling machine more destructive than the heavy-footed horse? Which does the most damage, steel hoofs or chain wrapped tires? The evidence procurable is overwhelmingly in favor of the latter.

So long as roads and streets are constructed to suit the needs of horse traffic—and they serve their purpose very inadequately—it is to be expected that they will be unsuited to motor traffic. When the latter is in the ascendant, however, as it very soon will be, we may expect that the horse will be required to show cause why he should be permitted to damage any thoroughfare with his pounding feet. If evenhanded justice were to be done between horse and automobile traffic by the New York park authorities the former would be barred from driveway, avenue and boulevard until the brutes had acquired the knack of hitting the earth squarely with their armored feet or picked up the art of gliding.

SIX WHEEL SUSPENSION.

AMONG the novelties seen in the industrial motor vehicle section of the Paris show were two De Dietrich six-wheeled machines, a bus and a wagon, the suspension design of which is shown in the accompanying drawing. The steering device of these models is also in-



teresting. The turning of the steering wheel causes a longitudinal shaft to turn slowly in either direction. At the two ends of this shaft hanging levers are fixed, and from the ball-ends of these levers a couple of connecting rods transmit the desired motion to the pivoted arms of the leading and trailing axles. Both of these axles are of similar design and are of pressed steel of I section. The central axle is a fixed one and the wheels mounted thereon are driven from the differential countershaft by chains.

By using a six-wheel suspension, which reduces weight, it is considered possible to make use of pneumatic tires on motor buses and so lessen noise and wear in operation. Further than this, however, nothing of material consequence is gained, although many extravagant claims are made for the superiority of this construction in surmounting road inequalities.

The National Auto Transit Company has been organized to do a livery business in Newark, N. J. The capital stock of the concern is $25,000.

HARD WORKED MOTOR BUSES.

OBVIOUSLY it would be wrong to infer that all the gasoline motor buses listed as being in commission in London are at all times available for service. In a service so arduous it naturally follows that a considerable percentage of the total is constantly undergoing repair. The number in active use seldom exceeds 67 per cent of the equipment.

Some time ago the traffic engineers of the big bus companies waged a spirited rivalry to see who could boast of having the greatest number of service vehicles on the road. One company claimed to have 90 per cent of its rolling stock on the streets. That betokened the pride of ignorance, for other companies proved that it was practically impossible to maintain such a high road service efficiency without seriously impairing the value of the investment.

The whole question of service vehicle efficiency hinges on the method of administration. If, as is the custom of some companies, the machines are driven until they are unfit for public use, and then withdrawn for thorough overhauling, the proportion of active vehicles to idle ones is relatively low. If, on the other hand, they are kept at work by the aid of temporary and inadequate repairs, interruptions to service become frequent and eventually many are condemned to a prolonged stay in the workshop. This second method of administration is sure to be attended by low road service efficiency. Motor bus proprietors thus have the choice of losing earnings or insuring their machines for a long term of usefulness by systematic and thorough repair and shed treatment.

The last census of motor buses in London showed 935 vehicles in commission, distributed as follows:

Vanguard Motor Bus Company	379
London Road Car Company	217
London General Omnibus Company	207
Great Eastern Motor Omnibus Company	55
Thomas Tilling	31
Miscellaneous owners	46
Total	935

PROTECTED PNEUMATIC BUS TIRES.

AN INTERESTING protective device for pneumatic tires, which has been tried with success on motor buses, consists of a steel rim embedded in vulcanized fiber and secured to the outer cover of the tire. The fiber on the outer surface of the rim is fitted in sections containing hardened-steel rivets. The tread can be renewed at little expense. The actual rubber tire is relieved of all wear, acting merely as a shock absorber. On snow-covered and slippery roads this protected tire behaved in a highly satisfactory manner.

A sixteen-passenger bus is operating between Salina, Kan., and neighboring towns.

A steam ambulance has been purchased for the Philadelphia General Hospital at a cost of $4,000.

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Wagon Maintenance

Tips to New Drivers and Caretakers About Things Likely to Escape Their Attention

IF THE working parts of a motor wagon are not properly lubricated much mischief may result. The object of lubrication is to prevent friction and wear by interposing a film of oil between the two bearing surfaces, thus preventing actual metal to metal contact. If a piece of metal perfectly machined is examined by the unaided eye, the surface has an extremely smooth appearance, but with the aid of a magnifying glass a rough condition of the surface is revealed. If two such surfaces are rubbed together these irregularities will be ground off as the result of friction. This is exactly what happens when bearings are allowed to run without proper lubrication. As this condition prevails throughout the power plant, it is readily seen how necessary is proper lubrication. Especially is this the case within the cylinder.

Removing Dirty Oil from Crank Chamber.

Many motor wagon operators give little or no thought to the matter of letting out the old oil from a crank chamber. It is a dirty job, so they just snap up their lubricating buttons and allow the engine to go on as usual. The chamber wants a good flushing out with kerosene occasionally, for it should be remembered that dirty oil is charged with metal particles in a very finely divided state, and consequently forms a first-class grinding medium.

Dirty Fuel.

Be sure and strain the gasoline. A curious commentary on this habitual precaution is the fact that notwithstanding this careful treatment, motors continue to stop through clogged carburetter jets, and from other equally simple and to be deplored causes. Perhaps the most live and general cause for this is the treatment which the funnel receives as a general thing when not in use. However carefully the fuel may be strained, the care is of no avail while the lower part of the funnel is dirty.

Durability of Driving Chains.

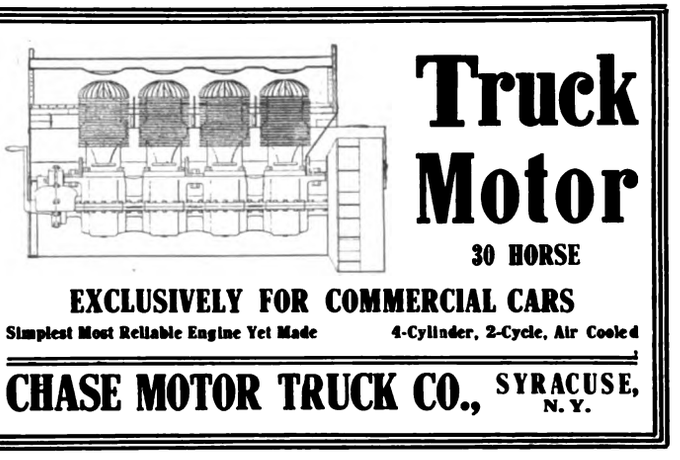
It has been estimated that the life of a driving chain would be doubled if it was enclosed in a case which would afford it ample protection from dirt and plenty of lubrication. This would bring the durability of an average chain under careful usage up to something like 15,000 miles. The position of the chains is usually such that they are exposed to all the dirt of the road. They are in no way protected from sand and mud, their very lubrication serving to increase their power of catching and holding particles of foreign matter which serve to increase the running friction and decrease the efficiency of the system. Yet it is perfectly possible to avoid all this by employing some sort of mud guard in the form of a complete enclosure, and a receptacle for the lubricant, which in this event may be fluid oil instead of the heavy grease usually employed. And, indeed, this would afford better results, the use of non-fluid oils now being compulsory. So far as is known, there are only one or two machines now on the market which use any device of this description, yet these are comparatively simple, and are of the most inexpensive construction. In one the framework, which is of light metal supports a casing of heavy leather which though by no means handsome, yet serves its purpose to the best possible advantage, and is easily demounted when access to the chains is necessary. Probably an improvement over this method of construction would be the use of light sheet metal for the side pieces, with an angle iron framework of light yet strong construction as skeleton upon which to mount it. Such a device might easily be contrived by any mechanic for the individual user.

Renewing Worn Bearings.

It often happens that a bearing which has worn unduly, or developed a tendency to heating, may be improved, if not wholly cured, either by altering the bearing surface by the substitution of new bushings, or by lining those already in place either with babbit, or some of the high-speed anti-friction metals, of which several different grades may be obtained. As a rule it is fully as advisable to line or "pack" the bushings with a soft metal of this description, as it is to attempt to form it into a bushing, the shell of the old bushing serving very well as a holder for the new material, and also working to no disadvantage if allowed to come into contact with the journal at the ends. In fact a bearing of this description frequently is found to last much longer and to give even better results than one composed entirely of the softer metal. The process of renewing an old bearing in this way is by no means a difficult one, and can readily be carried out in any ordinary machine shop.

Giving Care to Chain and Sprockets.

Drivers of chain-driven wagons will find their machines will run better if every time they are washed the chains and sprockets are brushed off thoroughly with kerosene and rubbed over with a light coat of graphite and grease. By following this treatment consistently, not only are better running results obtained, but the wear on both chains and sprockets will be reduced materially.



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Information for Buyers

Show Models Not Described Before.

IN describing the models on view at the Chicago show mention was not made of the products of four concerns which exhibited.

The Gifford Pettit Mfg. Co., of Chicago, showed a three-ton gasoline truck of excellent design, fitted with four cylinder engine rated at 30-35 hp. The transmission is of the sliding gear type, giving three forward speeds, the countershaft being idle when the machine is running on high speed and the gears being large with wide face. The front and rear axles are equipped with roller bearings. The front axle is of 2½ inch I-beam pattern, the rear being 2½ square, dead. The frame is of channel steel, 5 inches deep with 1⅞ inch flange. Wheels of 36 inch diameter are used both front and rear, 5 inch single tires being fitted on the forward pair and 3½ inch twins on the drivers. The front springs are 43 by 3 inches with 14 leaves, the rear ones 52 by 3½ inches with 15 leaves. The weight of the chassis is 5,000 pounds. The wheel base is 120 inches. Tread is 56 inches. The engine is water cooled, the pump being gear driven. The motor bore is 4¾ inches, the stroke being 6 inches. Two systems of ignition are fitted, make and break with low tension magneto, and jump spark with coil. An eleven feed mechanical oiler takes care of the lubrication. The steering gear is of worm and segment type. Large internal expanding and external contracting brakes are employed, the former being bronze to steel and the latter camel's hair to steel.

The Worth Motor Car Company, of Evansville, Ind., showed two gasoline models with friction disc transmission, a 16 passenger bus and a 3-ton truck. The chassis of each is fitted with a 60 hp. four cylinder engine. Jump spark ignition is used. Cooling is accomplished by means of gear driven pump and cellular radiator which can be easily drained. Oil can be used instead of water in the radiator in winter in order to prevent freezing. Worm and segment steering is used. The front axle is of I-beam pattern, 2¼ inches. The rear axle is a solid 2¼ inch forging. The frame is pressed steel, 5 inches deep. Springs are semi-elliptic. The tread can be varied from 56½ to 60 inches. Wheel base is 134 inches. Two band brakes are fitted to the rear wheels. The transmission consists of a shaft which is connected to the engine shaft with a flange and which has two smooth-faced discs, bolted solid to flanges, which are forged to the shaft. These two discs have two traction wheels with paper rings which come in contact with the smooth surface of two discs on opposite sides. In moving the car forward the left hand traction wheel is in contact with the front disc, while the right hand is in contact with the rear, and vice versa when the car is moving backwards. Thus there is no lateral strain on the bearings, as one wheel balances the other and one disc balances the other. The transmission shaft is connected to the rear wheel by two chains.

The Pittsburg Motor Vehicle Co., of Pittsburg, exhibited an electric 750 pound wagon which travels at 10 miles an hour and has a range of 40 miles on one battery charge. This model weighs 2,500 pounds. A larger model, with load capacity of 1,500 pounds, capable of sustaining an overload of 66 per cent, was also shown. The 1,500 pound model has a speed of 9 miles an hour and weighs 4,500 pounds.

The Weeks Commercial Vehicle Company, of Chicago, exhibited a 1,000 pound gasoline delivery wagon fitted with high wheels, double friction transmission, and two cylinder opposed engine developing 20 hp. Its merchandise dimensions for standard body are as follows: Length, 71 inches; width, 42½ inches; height, 52½ inches. The wheel base is 84 inches. Tread is standard. The motor is vapor and air cooled, bore and spoke being 4 inches. The maximum speed is 18 miles per hour. Full elliptic springs are fitted, platform in rear. Wheels are of 38 inch diameter equipped with 2½ inch tires. Internal expanding brakes are used. Jump spark ignition. The machine will carry a 50 per cent overload.

* * *

MOTOR BUS BEHAVES WELL IN HIGH CLASS COMPANY.—Spectators of the three-day reliability run promoted by the Chicago Motor Club were surprised that a 12 passenger motor bus should have been entered for competition. As matters turned out, however, the big car performed with as much credit as the best of the machines entered, carrying its 2,800 pound load for the entire journay without the slightest mishap which could give the judges occasion for recording penalty marks. The machine in question was a stock Rapid model, the chassis of which is interchangeable for bus or wagon work and which is fitted with a 30 hp. two cylinder engine. On the morning of the first day's run the bus afforded considerable amusement for the crowd present at the start, for it was known that its driver did not know of the hills, sand and gravel to be encountered. Just this side of Ottawa is a long and steep hill, made worse by two sharp turns in its course. This hill is followed by several miles of deep gravel recently put on the roads to be scattered and leveled later. It is on hills and in sand that the heavily loaded car is tested most severely. When it was learned that the Rapid had pulled through an hour ahead of the schedule made for light pleasure cars, everybody joined in the cheering reception.

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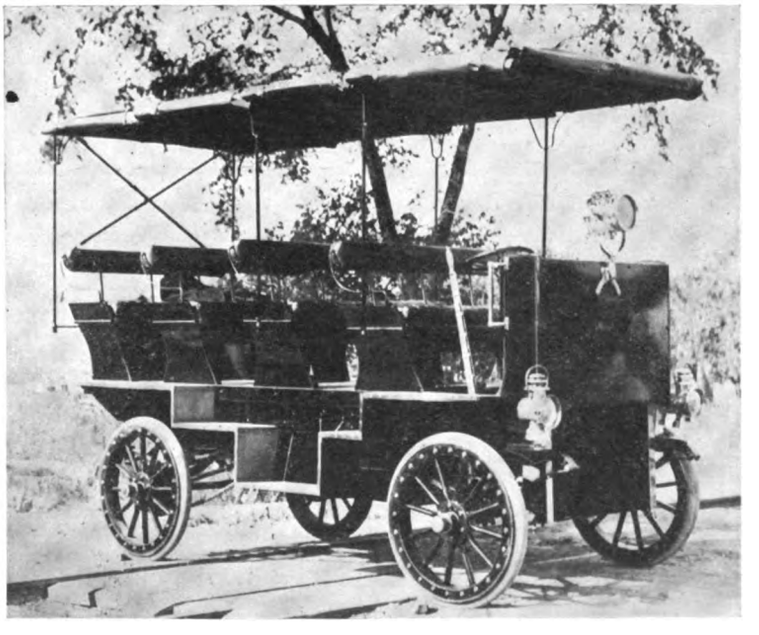

Rapid Bus which Competed in 3-day Reliability Run.

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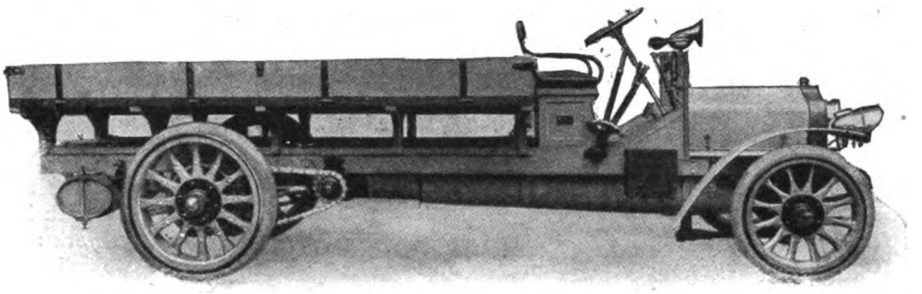

The "SAFIR" 4-Ton Truck

Its 1907 Record

First Prize, Gold Medal, Swiss Reliability Trials, May 9-14 (17 Competitors.)
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This truck is especially economical in operation and maintenance. The Saurer carburetor assures economical fuel consumption and obviates sudden speed variations. The gradual effects of the Saurer motor brake keeps tire wear at the minimum. The Saurer self-starting appliance, invaluable in congested traffic, enables the driver to start the engine withour leaving his seat. Chrome nickel steel for all transmission members. Parts very accessible and easily demounted. Engine develops 30 hp. at 1000 revolutions per minute.

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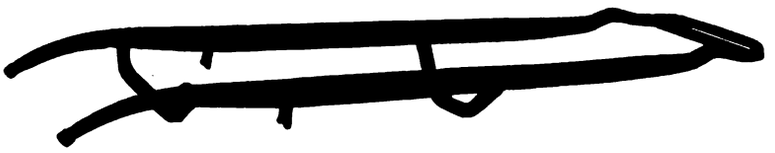

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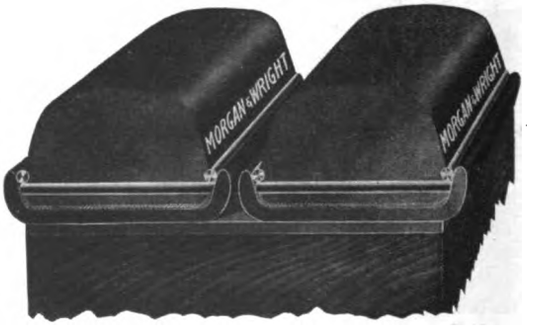

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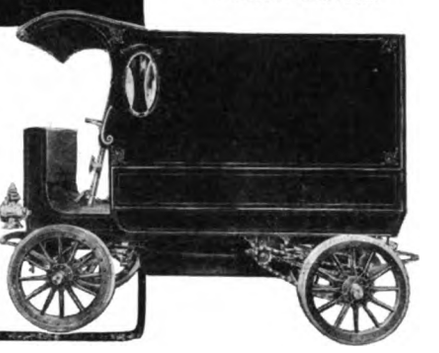

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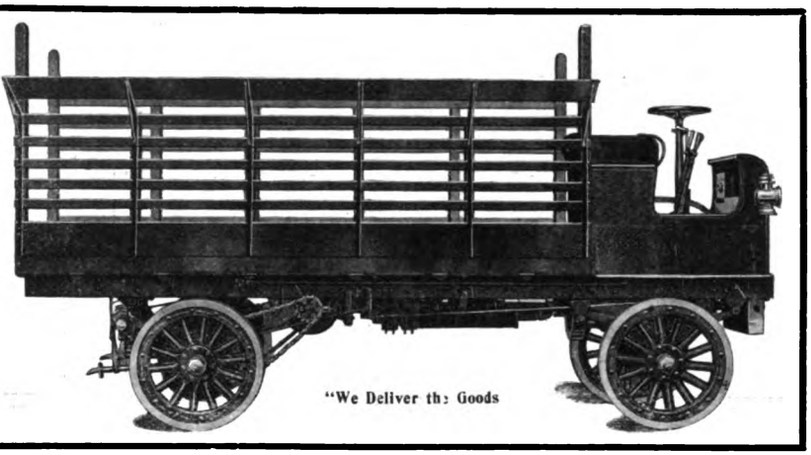

TRADE MARK TRADE MARK

GOODRICH RUBBER

EQUIPS THE PHAETON OR MOTOR TRUCK EQUALLY WELL

Lively under big or little loads; no tendency to smash down and positively no disintegration on account of brittleness

GOODRICH SOLID RUBBER TIRE QUALITY
IS STILL ON THE TOP SHELF

The B. F. Goodrich Rubber Company
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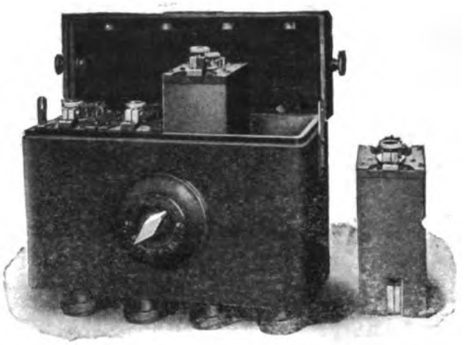

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¶ Of course you do.

¶ But do you know the extent of the economy to be gained by the substitution of motor trucks and wagons for horse drawn vehicles?

¶ Few people do.

¶ "The Power Wagon" assists every branch of business in which local transportation plays an important part, by showing how and to what extent motor vehicles may be used to advantage.

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If it does you should subscribe for the paper.

Price, $2.00 a Year

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Power Wagon Motors

are made to suit any construction of vehicle. Let us have your specifications

Send for Circular 1059, it gives particulars.

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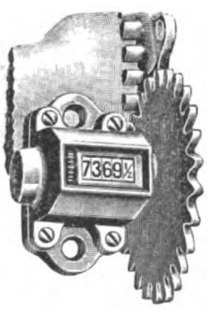

KEEP TRACK OF

Mileage and Speed

¶ It is fully as important to register the distance traversed by a power wagon as it is to have a record of the fuel or electricity consumed, or the quantity of lubricant used. The mileage and speed of the vehicle is most accurately indicated by a VEEDER Instrument.

The Veeder Mfg. Co., Hartford, Conn.

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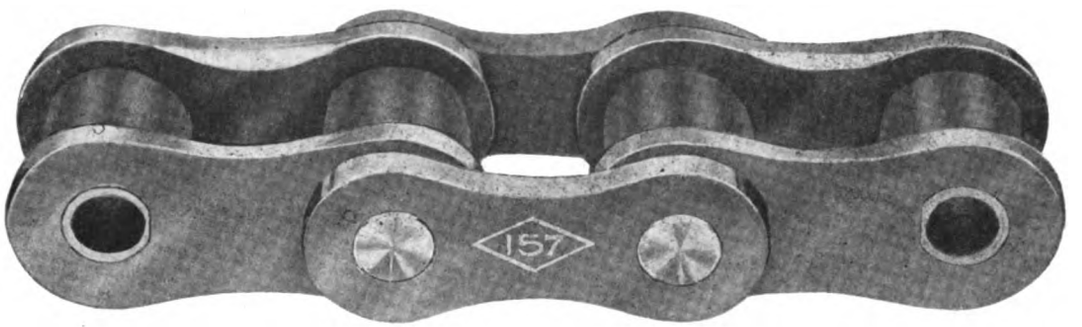
The New Diamond Chrome-Nickel-Steel Chain



is the latest advance in the automobile industry. It is lighter than any other chain of equal width and pitch, but has greater tensile strength and safely does harder work.

The chrome-nickel-steel side bars cushion severe blows from the engine without permanently stretching, and the tough and hard nickel-steel rivets resist wear better than any other material known for the purpose. That is why the pitch of Diamond Chains does not change.

All metal in Diamond Chains is made for us especially for use in chain parts. Our method of hardening makes rivets which positively will not crack.. Other facts about Diamond Chains are given in our book on "Chain Power Transmission", sent free on request.

Diamond Chain & Mfg. Co.

Capacity 8,000,000 ft. per year

243 West Georgia Street **INDIANAPOLIS, INDIANA**

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The best tire—the cheapest tire—is the one that will last longest.

If Hartford solid tires will give longer life and stand more continuous strains—you want to know more about them, don't you?

We say they will. Men who have used them say they do. Dealers who have equipped power wagons and vehicles with them say they are best.

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When a purchaser comes and asks for "the best" tire to be placed on his wagon or truck we want you to see that he gets

HARTFORD TIRES

and he'll be satisfied—and so will you.

Why not write for our beautiful catalogue—it gives tables of comparisons and other interesting matter worth preserving.

The Hartford Rubber Works Co.

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ATLANTA, GA., 55 Auburn Ave.

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

No. 39 **FEBRUARY, 1908** No. 39

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WALTER WARDROP, Editor

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The Hire-Purchase System

Policy Devised for Overcoming the Timidity or Prejudice of Firms Thinking of Employing Power Wagons

QUITE a number of concerns which hotly covet the advantages to be derived from the employment of power wagons are deterred from buying the machines because they unwarrantably assume that their employes lack the capacity to successfully administer them. These faint-hearted establishments are fighting shadows. It is more than probable that their subordinates would, if given the chance, easily succeed in doing what others no better equipped for undertaking a novel enterprise have already accomplished. Progress is the law for the human race.

Some are by nature unafraid. Others, on the contrary, are as timid as mice. The former boldly help themselves to the good things of life, while the latter buy them for more than their market value. The inconvenience of performing certain duties is, of course, often responsible for their being shirked. Hence the middleman, who exists as an accommodation for the timid and overburdened classes of the commercial world. He is the "next friend" of the man who lacks nerve to be master of his business, or of him who may have occasion for subletting some minor feature of it.

* * *

Such contractors are to be found in the field of the power wagon. They undertake maintenance, or operation and maintenance. If it should appear to the customer that only the dregs of power wagon economy are being offered him, the contractor will even offer to sell the machines on the installment plan, payments to be made quarterly within the period of three years, but the seller's maintenance agreement to be operative meanwhile.

This latter plan is singularly attractive to those who object to the employment of the machine upon the ground that its first cost is too high for their purse. It also has the advantage of giving the ostensible owner the fullest opportunity to acquaint himself with the operating methods required to develop maximum economy, it being assumed that expert operators are endowed with qualities for obtaining a higher service efficiency than amateurs.

* * *

Its most impressive feature, however, is the straight appeal it makes to common sense, it being evident that the sellers have the fullest confidence in the physical and commercial properties of the machine, which faith is not to be discounted by reason of the fact that money is provided to sustain it. It goes without saying that nobody but a fool would consider engaging in a business which promised disaster, near or eventual. Care and proper application, the two essentials for successful power wagon operation, are in reality the only commodities sold under such a contract, the element of faithfulness in performance being well guaranteed where such conditions are given.

It is further stipulated, under the terms of the contract drawn to suit this system of hire-purchase, that the buyer shall pay in advance for the cost of tires and body. The reason for this is only partly obvious. Strictly speaking, the body is not a component of the mechanism. Anyway it is not sold with the expectation that its utility has to be demonstrated. The art employed in its construction is very ancient. Tires are excluded upon the ground that they are perishable, as well as on account of the difficulty in determining what it will cost to maintain them in service where loads, speeds and other factors working adversely to rubber are not precisely fixed or wholly within the control of the contractors.

The buyer's acceptance of the seller's maintenance agreement is a fundamental of the hire-purchase contract. In no other way could the seller assure himself that the machine would be well cared for by the purchaser. Insur-

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ance against accident or fire is another condition which precedes acceptance of the contract.

Suitable provision is made for terminating the contract in the event that the service is not to be the liking of either of the parties. Should a customer desire to void the contract by outright purchase at any time within the period originally fixed for installment payments, he can do so and thus save the 5 per cent which the seller charges as a premium for carrying the account. In this event the maintenance feature of the contract only is operative, and it too may be cancelled at the option of the buyer if he feels equal to assuming the whole burden of operation.

Many examples of satisfactory operation can be found in which this system of hire-purchase is in force. It is the most effectual policy yet devised for overcoming the nervousness, timidity, suspicion, prejudice or ignorance of people who are attracted by the vaunted economy of the power wagon, but cannot make up their minds to buy the machine. Mahomed's sanity would have been suspected if he had not gone to the immovable mountain which he commanded to come to him.

* * *

Here are some of the principal conditions to be observed by the purchaser of gasoline wagons under the terms of one of these hire-purchase contracts:

1. Although the drivers are in the employ of the purchaser, they are to obey such instructions as the inspector appointed by the seller may give regarding general maintenance and adjustment.

2. The drivers should have at least ten hours off duty on arriving at their employer's garage in the evening, and an additional hour per day must be allowed to each for the purpose of lubricating his vehicle in the garage, and cleaning the portion forward of the driver's seat, this provision being based upon a knowledge that many firms leave the cleaning of the vehicles to ordinary workmen, with the result that the hose-pipe is often injudiciously used, and water is introduced beneath the bonnet.

3. A weekly visit must be paid by the vehicle to the garage of the seller, on a day agreed upon between the contracting parties, and it is to be taken there in a clean condition.

4. Should any mechanical trouble arise during the week, and it is considered that adjustment and repairs are necessary, the vehicle must be taken immediately to the garage of the maintaining company.

5. While the maintaining company, on its part, undertakes to carry out a weekly inspection at its garage, to make all necessary adjustments and repairs, renew worn and broken parts, and to give two complete overhauls each year at its works, responsibility is not taken by the company for such breakages as are due to accident or frost.

6. Spark-plugs are also excluded, and the company stipulates that lubricants of a quality considered by it to be satisfactory must be used.

7. The distance run each quarter is not to exceed 6,500 miles per vehicle, that is, an average of 500 miles per week, and the speed limit is not to exceed 15 miles per hour, whether the wagon is loaded or unloaded.

8. It is considered by the company that half a day per week will be the average time required for the weekly inspection, but it is hoped that in many instances the vehicle may not be detained more than an hour.

ECONOMY OF MOTOR FIRE VEHICLES.

WHEN you stop to reflect upon the work performed by horse drawn hose and chemical wagons it becomes evident that their maintenance cost is singularly high for the limited mileage they cover in the course of a year. In a city of 200,000 inhabitants such vehicles will not travel more than 300 miles per annum. In the majority of small cities the mileage will not exceed 150. In St. Louis and cities of its size the figures reach 600 miles a year, while in New York and Chicago the vehicles may, at the outside, be called upon to cover 1,000 miles in a twelvemonth.

But whether the mileage is high or low the expense of keeping a team of horses, and often a spare animal, for each vehicle goes on just the same.

Motor hose and chemical wagons, which can be operated and maintained at minimum expense, are no longer regarded with indifference by fire department chiefs. Their principal concern nowadays is to get appropriations for the purchase of the machines whose service is universally acknowledged to be wonderfully superior to horse drawn vehicles maintained for the same purpose.

Baltimore's fire and police departments are now equipped with motor wagons.

MANUFACTURERS COMPLETE THEIR ORGANIZATION.

THE organization of the Commercial Motor Vehicle Manufacturers' Association has been completed by the election of officers, the appointment of an active manager, the adoption of by laws and the procuration of a charter. The officers of the association are as follows:

President—G. W. Weeks, Weeks Commercial Motor Vehicle Co., Chicago, Ill.

Vice President—Oscar Lear, Oscar Lear Automobile Co., Springfield, O.

Treasurer—H. G. Hamilton, Rapid Motor Vehicle Co., Pontiac, Mich.

Secretary—J. E. Burke, Lambert Motor Truck Co., Anderson, Ind.

General Manager, Walter Wardrop, Chicago, Ill.

On January 16 the board of management appointed Walter Wardrop, publisher of the Power Wagon, as their deputy. The benefits to be derived from membership in the association will be explained at length by him, in person or by mail, to all who are eligible for admission to the organization.

Out of 158 vehicles shown at the Paris industrial motor vehicle exhibition, only 15 were fitted with multiple disc clutch, 103 employing chains for the final drive.

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Perilous Construction

Three and a Half Ton Wagon to Travel at 40 Miles an Hour Being Built For Chicago Police Department

SOMEBODY should apply for an injunction to restrain the Chicago police department from operating the motor wagon which is being constructed at the municipal repair shop. It would be criminal not to protest against the commissioning of this monstrous machine which, owing to faulty and inharmonious design, has potential capacity for great mischief.

Fancy a vehicle weighing, loaded, three and a half tons, its top speed 40 miles an hour, its center of gravity much higher than is safe, the energy of its 55 hp. engine passed through sliding gear transmission that is expressly designed for touring cars, brakes and steering gear intended for like duty, and its 36-inch wheels, shod with 3½-inch solid tires! Fill in the picture with such details as light driving chains running over the small sprockets of a jackshaft, and a channel iron frame which affords inadequate security against distortion. Term this mechanical hodge-podge a riot call wagon and you have some idea of the audacity of its designer, who exultingly asserts that, since no automobile manufacturer would undertake its production, he created the weird and awful thing with his own hands.

"I couldn't get any manufacturer to make the machine as I designed it," said the author of its being, his eyes blazing in triumph, "so I bought some parts, made others here in the shop, and built it myself."

God be praised for that admission. It would be a terrible indictment against the industrial motor vehicle industry if the assembly of this freak was chargeable to one of its members. It is the crudest example of automobile construction ever witnessed in late times. Powerful influence would have to be exerted in order to have it admitted to a museum of mechanical miscellany.

No two parts in the whole machine are harmoniously related. How could it be otherwise, seeing that they were bought from manufacturers who were ignorant of what was being undertaken by the purchaser. The wheel base is 110 inches. The hood over the engine looks like a dog house The chassis platfrom almost comes to your middle. Everything about the machine proclaims its bastard production. Its lines are unhandsome enough to make you shriek. Despite its show of strength, it is relatively weak. It is only fit for the scrap heap.

And this mongrel machine cost $3,000.

"We couldn't get it built for $6,000," remarked one of the workmen in the shop where it was put together.

No wonder.

"What is the regular business of this shop?" the caller inquired.

"Making and repairing police patrol wagons," he was told.

The establishment was utterly devoid of the plant or equipment required to build or assemble motor vehicles.

"When do you expect to have this machine ready for service?"

"In about three or four weeks. We are testing it now. The department needs about ten such wagons."

The visitor felt like yelling "Police!"

If the model now being built is ever put in service the lives of the fourteen bluecoats it is designed to carry will be put in deadly peril. No prudent automobile engineer would dare to countenance the operation of this machine at 40 miles an hour. If the city must have its amateur automobile builders, let their sanity as constructors be determined before they are permitted to waste public funds, or jeopardize the lives of brave public servants.

TAXICABS FOR TOLEDO.

ARRANGEMENTS are now being completed whereby the Atwood Automobile Co., of Toledo, will operate Elmore motor cabs in that city. The Elmore cab is fitted with a two-cycle engine. Its makers, however, have all they can do at present in supplying the machines ordered for service in Chicago, and on that account it is not likely the Toledo service will be commenced before spring is well advanced. The Toledo machines will, of course, be fitted with taximeters.

During the twelve months ending October 31 last the total number of motor cabs licensed for service in London was 655, of which the General Motor Cab Company possessed 506 machines, the United Motor Cab Company 67 and the London Motor Cab Company 82. Altogether there were at the period named seven operating companies, the combined future deliveries for which were in excess of 3,000 vehicles.

CHEAPER CAB RATES FOR PARIS.

PARIS is soon to be supplied with a cheaper motor cab service than now prevails. The Marquis de Dion is forming a $400,000 company to operate 200 machines, 25 of which will be placed in private and semi-private service.

The daily operating expenses per unit—including depreciation, tire expense, repairs, staff charges, garage, insurance, taxes, etc.—are calculated at $2.60. The prospectus puts the daily receipts at $7, five hours being taken as actual daily running time, with two hours for stoppages. If only 100 cabs are operated the daily operating cost is given at $2.80 per unit.

At present New York's fleet of motor busses is earning an average of about 48 cents per vehicle mile.

The authorities of Kansas City and Atchison are testing motor-driven fire apparatus.

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Electric Truck and Trailer Employed to Pull 11 Tons of Ice in Cincinnati.

Modern Ice Delivery Methods

Remarkable Economy Shown by Electric Machines Employed by the Cincinnati Ice Delivery Company

IT seldom happens that the power wagon is assigned to work under conditions which are calculated to develop its economy as a mere machine. When it does it may always be expected to brilliantly establish its merit in this respect.

Constancy of employment is so decisively advantageous to the machine, and correspondingly so disadvantageous to draft animals, that whenever the opportunity is presented for comparing both in such active service the observer is immensely impressed with the superiority of mechanical transportation. The only conclusion to be drawn from this is that the closer the work of a power wagon approximates that of a labor-saving machine the more economically it will discharge its true functions. Its real capacity is only to be discovered in work which taxes the horse to the limit of, or beyond, his available power.

* * *

Now the delivery of ice in a hilly city like Cincinnati furnishes such conditions as have just been described. It is not surprising, therefore, to learn that as a result of a demonstration, which lasted much longer than was necessary in order to bring convincement of the power wagon's superiority in such service, three 5-ton electrics have superseded twelve two-horse teams. The demonstration had another effect even still more important than this substitution would imply. It avoided the investment of $60,000 in a warehouse to supply a district remote from the central ice producing plant, and connected thereto by a road containing many steep hills up which horses could not pull their heavy loads, but which were easily within the capacity of the machine to ascend. Collateral savings of this sort are not nearly so rare as might appear. Nor are they often credited to the machine whose work it is that brings them into view.

The honor of having successfully demonstrated the value of the power wagon in the delivery of ice in Cincinnati belongs to the Couple-Gear Freight Wheel Company, of Grand Rapids, whose four-wheel drive machine carries its load evenly distributed on all four wheels. Work began at 2:30 in the morning and lasted until late in the afternoon. A block of ice weighs either 300 or 400 pounds. Loading operations are performed with great expedition, two men handling and placing six tons in ten minutes if nothing occurs to cause interruption of the work. The demonstrating wagon covered 20 miles daily on an average, although the specimen daily report sheet which accompanies this article, shows that on this particular occasion the machine traveled 30½ miles.

* * *

On the third day of service the wagon, loaded with 42 blocks of ice, was driven against the curb, the driver in a moment of excitement having forgotten to apply the brakes. The steering quadrant was broken. It was repaired in an hour. The incident gave occasion for a thorough examination of the machine in order to discover if any other part needed attention. No further damage was found than has already been related. Thus one day was lost.

Throughout the demonstration, which lasted from June 10 to September 1, 1907, the battery was never entirely discharged in any one day's service. The battery contained 44 cells of 19 plate w. b. The efficiency of the four-wheel drive is evident from this statement.

* * *

The daily load averaged 29 tons. Much time was consumed in discharging loads. The cost of electricity amounted to $1.48 a day, being bought at 4 cents per k. w. Upon all trips the machine's mileage was registered by a distance recording instrument. Voltage readings were taken at the beginning and end of each day's work, and recorded in the daily report sheets.

The daily report sheets, of which a specimen is

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printed below, give a clear idea of the nature of the work performed by the machine, loading at three plants, discharging at restaurants and feeding supplies to other wagons:

JULY 23, 1907.

Volts, 108.	A. M.	
Lv. Palace Garage	2:30	
Ar. Poplar Ice Plant	2:50	42-300 lb. blocks on.
Lv. Poplar Ice Plant	3:15	
Ar. Manhattan Restaurant	3:40	40 blocks off.
Lv. Manhattan Restaurant	4:55	
Ar. Delicatessen Restaurant	4:57	2 blocks off.
Lv. Delicatessen Restaurant.	5:00	
Ar. Plum St. Plant	5:15	
Lv. Plum St. Plant	5:50	42 blocks on.
Ar. Postoffice	6:07	17 blocks to No. 10 wagon.
Lv. Postoffice	6:40	25 blocks to No. 25 wagon.
Ar. Champion Ice Plant, Cov., Ky.	6:52	42 blocks on.
Lv. Champion Ice Plant, Cov., Ky.	7:20	
Ar. 4th & Walnut Sts.	7:49	
Lv. 4th & Walnut Sts.	7:50	No wagons.
Ar. 6th & Walnut Sts.	7:55	14 blocks to No. 2 wagon.
Lv. 6th & Walnut Sts.	8:20	14 blocks to No. 101 wagon. 14 blocks to No. 24 wagon.
Ar. Plum St. Plant	8:35	42 blocks on.
Lv. Plum St. Plant	9:05	
Ar. 5th & Carlisle Sts.	9:23	14 blocks to No. 8 wagon.
Lv. 5th & Carlisle Sts.	10:04	14 blocks to No. 28 wagon. 14 blocks to No. 31 wagon.
Ar. Champion Plant	10:24	33 blocks on.
Lv. Champion Plant	10:55	
Ar. Eastern & Hazen Sts.	11:50	22 blocks to No. 51 wagon.
Lv. Eastern & Hazen Sts.	12:08	
Ar. Eastern & Torrence Rd.	12:20	9 blocks to Corbley's wagon.
Lv. Eastern & Torrence Rd.	1:50	2 blocks to Culbertson's wagon.
Ar. Champion Plant	2:45	46 blocks on.
Lv. Champion Plant	3:18	
Ar. Armour's Packing House	3:35	46 blocks off.
Lv. Armour's Packing House	4:15	
Ar. Palace Garage	4:30	

Volts, 86; weight carried, 74,100 pounds; distance traveled, 30½ miles; actual running time, 5 hours and 12 minutes.

* * *

In 71 working days the machine hauled and delivered 4,115,020 pounds of ice, or almost 2,058 tons. The record of tonnage for the full period of demonstration was as follows:

JUNE TONNAGE.

Monday, June 10	40,200 lbs.
Tuesday, June 11	64,350 lbs.
Wednesday, June 12	Curb
Thursday, June 13	48,900 lbs.
Friday, June 14	37,200 lbs.
Saturday, June 15	61,600 lbs.
Sunday, June 16	....
Monday, June 17	47,800 lbs.
Tuesday, June 18	47,800 lbs.
Wednesday, June 19	49,200 lbs.
Thursday, June 20	64,200 lbs.
Friday, June 21	37,800 lbs.
Saturday, June 22	51,600 lbs.
Sunday, June 23	....
Monday, June 24	62,400 lbs.
Tuesday, June 25	49,800 lbs.
Wednesday, June 26	62,400 lbs.
Thursday, June 27	62,400 lbs.
Friday, June 28	50,400 lbs.
Saturday, June 29	50,400 lbs.
Sunday, June 30	....
	888,450 lbs.

JULY TONNAGE.

Monday, July 1	59,400 lbs.
Tuesday, July 2	56,400 lbs.
Wednesday, July 3	50,400 lbs.
Thursday, July 4	Holiday
Friday, July 5	63,000 lbs.
Saturday, July 6	50,400 lbs.
Sunday, July 7	....
Monday, July 8	50,400 lbs.
Tuesday, July 9	63,000 lbs.
Wednesday, July 10	64,200 lbs.
Thursday, July 11	64,350 lbs.
Friday, July 12	63,000 lbs.
Saturday, July 13	71,200 lbs.
Sunday, July 14	....
Monday, July 15	61,800 lbs.
Tuesday, July 16	60,220 lbs.
Wednesday, July 17	75,600 lbs.
Thursday, July 18	75,600 lbs.
Friday, July 19	63,000 lbs.
Saturday, July 20	64,200 lbs.
Sunday, July 21	....
Monday, July 22	63,000 lbs.
Tuesday, July 23	64,200 lbs.
Wednesday, July 24	76,800 lbs.
Thursday, July 25	74,100 lbs.
Friday, July 26	63,900 lbs.
Saturday, July 27	64,200 lbs.
Sunday, July 28	....
Monday, July 29	63,200 lbs.
Tuesday, July 30	61,800 lbs.
Wednesday, July 31	61,800 lbs.
	1,649,170 lbs.

AUGUST TONNAGE.

Thursday, August 1	49,800 lbs.
Friday, August 2	46,500 lbs.
Saturday, August 3	62,800 lbs.
Sunday, August 4	25,200 lbs.
Monday, August 5	62,400 lbs.
Tuesday, August 6	61,400 lbs.
Wednesday, August 7	71,100 lbs.
Thursday, August 8	55,200 lbs.
Friday, August 9	52,500 lbs.
Saturday, August 10	64,500 lbs.
Sunday, August 11	....
Monday, August 12	65,200 lbs.
Tuesday, August 13	64,800 lbs.
Wednesday, August 14	54,000 lbs.
Thursday, August 15	54,000 lbs.
Friday, August 16	54,000 lbs.

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Saturday, August 17	50,700 lbs.
Sunday, August 18	....
Monday, August 19	60,900 lbs.
Tuesday, August 20	54,000 lbs.
Wednesday, August 21	54,000 lbs.
Thursday, August 22	54,000 lbs.
Friday, August 23	54,000 lbs.
Saturday, August 24	52,800 lbs.
Sunday, August 25	....
Monday, August 26	51,900 lbs.
Tuesday, August 27	64,800 lbs.
Wednesday, August 28	75,300 lbs.
Thursday, August 29	54,000 lbs.
Friday, August 30	53,600 lbs.
Saturday, August 31	54,000 lbs.
	1,577,400 lbs.

* * *

The Cincinnati Ice Company is now hauling 11-ton loads with one of its machines, five tons on the motor truck and six tons on a trailer. This service, which extends all over the city, regardless of hills, is maintained for the purpose of feeding light delivery wagons. In speaking of it the manager of the company's mechanical department says:

"So far it has more than made good all the claims made for it, and we are extremely well satisfied. We have arranged our truck with a trailer, closely coupled, upon which we load over six tons, and we place from four to five tons upon the truck. We have loaded as much as 11½ tons and moved it very successfully over our paved streets with a normal battery discharge. We have tested it with maximum load on a hill paved with cobble stones and having about 15% grade. The truck was brought to a stop in a hole almost half way up the hill, but moved off in splendid shape with the controller in the third position. While we have not had an opportunity of getting actual comparative data with two-horse wagons, we feel that with proper care and manipulation it can do the work of from four to five two-horse teams. It is particularly adapted to heavy loads and shows the greatest efficiency when loaded to or near its capacity.

"We expect to purchase more trucks in the spring, and will construct our own garage and have the machines taken care of by our engineering department."

CHICAGO'S WHEEL TAX.

THERE is little likelihood that any alteration will be made in the charges prescribed under the terms of Chicago's wheel tax measure.

While owners of automobiles are reluctant to admit that the terms of the measure impose the heaviest assessment upon vehicles which cause the most mischief to streets, yet they are prepared to submit with as good grace as possible since they are assured that draft animal owners cannot escape the penalties they so richly have earned. The latter made a desperate effort to reapportion the taxation, getting the joint committee on judiciary and license to recommend the substitution of the following schedule:

Vehicles	Old rate.	New rate.
One horse wagon	$ 5.00	$ 3.00
Two horses	10.00	6.00
Three horses	25.00	15.00
Six horses	35.00	20.00
Motor runabouts	12.00	10.00
Motor touring cars	20.00	15.00
Motor trucks and buses	30.00	25.00

A majority report, which was supported in council, defeated this attempt on the part of horse owners to dodge responsibility for the destructive traffic of their animals.

The team owners now talk of disputing the validity of the ordinance if it should be passed in its original form. No relief can be expected from the courts, as there is ample warrant for the imposition of the tax. If the old rate measure becomes a law the revenue available for street improvement will, it is expected, amount to $891,000, from which sum $170,000 will probably have to be expended in order to make collections, leaving the net revenue $721,000.

EDISON'S NEW BATTERY.

FEW who have read that Thomas A. Edison is endeavoring to develop a storage battery from which he expects 40,000 miles of service will on that account be deterred from buying electric vehicles of the present period. The world is grateful whenever its men of science achieve their worthy purposes. But it refuses to mark time while they are at work. It will be time enough to believe that Mr. Edison can accomplish what he has undertaken when he presents proof of its achievement. Our hope is in his perseverence.

So many contradictory rumors are afloat concerning the value of the Edison battery as developed, that the following statement from the inventor will be read with much interest:

"When I first completed my battery," said he, "I thought it was so perfect that I could improve upon it no further. I discovered that science, my master, had played a little joke on me and had only let me see a little way in the future instead of a long way. Now I have begun to manufacture another battery that can push a truck 40,000 miles instead of the 25,000 that was my fondest hope. I make no prediction for my new battery. I merely state that before it wears out it can drive a truck 40,000 miles."

From this it appears that Mr. Edison has signally failed in his first battery experiment. What assurance have we that his second experiment will be any more successful?

It will be carefully noted that Mr. Edison refrains from predicting the success of his new battery, further than to remark that it will be more efficient by 100 per cent than the one whose development is arrested. One cannot but wonder what he would have said if he had not felt called upon to exercise such restraint.

A taximeter cab service is being organized for New Orleans.

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The Need of Education

Necessity Which Exists For Overcoming Fixed Habits of Thought With Respect to Transportation

BY HAYDEN EAMES

HAS the time come when more serious attention to promising financial returns will be given to the commercial motor vehicle?

It has.

The natural vanity of those who have made so-called experiments in the use of power wagons has ascribed the causes in every case of failure "to the incomplete development of the art," rather than to the almost invariable causes of misapplication or misuse. It will come as a surprise to the majority of uninformed and unphilosophical readers—and most readers are both—to know that in the aggregate the failures have been in the hopeless minority. It will also come as a surprise to such people to know that as far as the electric power wagon is concerned, seven years at least have elapsed since its engineering development had reached a point where it afforded the cheapest possible means of distributing merchandise on a large scale in paved cities. For maximum economy of service the electric power wagon and the gasoline power wagon each has its own particular field, in which one infringes comparatively lightly upon the other, and in this field the statement above applied to the electric power wagon has been equally applicable to the gasoline power wagon for at least three years.

* * *

The admission of such an advanced development will at once stimulate the reader's inquiry as to why power wagons are not in more general use. The reasons are all most natural and simple, and have characterized the introduction of almost every radical change in transportation within the memory of man. It is wholly a matter of education—not mere ordinary education, but the overcoming of habits of thought crystallized by centuries of the use of draft animals and utterly inapplicable to the problems involved in the application of the new methods.

An express agent once condemned an electrical wagon on the ground that it took three-quarters of an hour to prepare the wheels for use in an unexpected snow storm. On the same occasion the sharp shoeing of horses required several hours. When the inconsistency was called to his attention his reply was, "We have always been doing that," referring to the time required for sharp shoeing the horses.

* * *

Individuals still persist in limiting the performance of power wagons to a schedule of service applicable to draft animals. Few, if any, take advantage of the possible exactitude available in regard to machinery to equip themselves with vehicles of capacities and speeds exactly suitable to accomplish their gross work with the least possible expense. They have been accustomed for centuries to the form of "motor" which slows down, and even stops, without the volition of the driver, and speeds up in the same unexpected manner; that almost invariably speeds up when overtaken, thereby materially contributing to the congestion of the streets and consequent retardation and increased expense of traffic; that frequently automatically strives to draw its wagon in front of every overtaking vehicle, with all the danger and congestion which this involves; which seldom pursues a straight course along a street and which, in spite of the lightening of the load, continually slows down, rather than speeds up, as the day wears on. Any inventor who submits a motor of such specifications for purchase to-day can count on filling a pauper's grave; and yet the public mind has become so absolutely habituated to this preposterous system of transportation that it insists on endeavoring to duplicate with the new labor saving service the conditions governing the use of the old.

* * *

The conditions have been further obscured by well intentioned and progressive engineers who have persisted in endeavoring to apply to the economical problems of the power wagon the data devised from railway practice. There are plenty of books on railway practices, but they are practically valueless in considering the economy of merchandise transportation by trucks and wagons. Philosophers recognize the human tendency to err in reasoning by analogy, and this is a case in point.

As in the case of all "labor saving machinery," the very expression should suggest that the fundamental basis of comparison is the "man day." How much more of your work can be done per day per man with new contrivances than with old, and how can the new contrivance be so applied as to represent a saving?

* * *

All this suggests the lines along which education has to be accomplished. The time when financial returns can be expected from the marketing of mercantile motor vehicles depends entirely upon the extent and diffusion of this education. Let us say that ten years ago there may have been five or six people in the world who understood the problems involved. Six or seven years ago there were probably a few thousand. The Persians have a proverb that "in telling a secret remember that your friend has a friend and your friend's friend a friend." It's an old and familiar saying to almost everybody, and it applies exactly in the present case. Where seven years ago there were a few thousand alive to the advantage of the power wagon and its method of application to their purposes, there are to-day hundreds of thousands who are on the brink of realization.

* * *

Where seven years ago there were a dozen to whom every horse drawing a merchantile vehicle was a living evidence of waste there are now thousands, and the day is not far distant—in fact, already come—when in case of failure people have ceased to ask "what's the matter with the vehicle?" but, instead, "what's the matter with the fool that's running it?"

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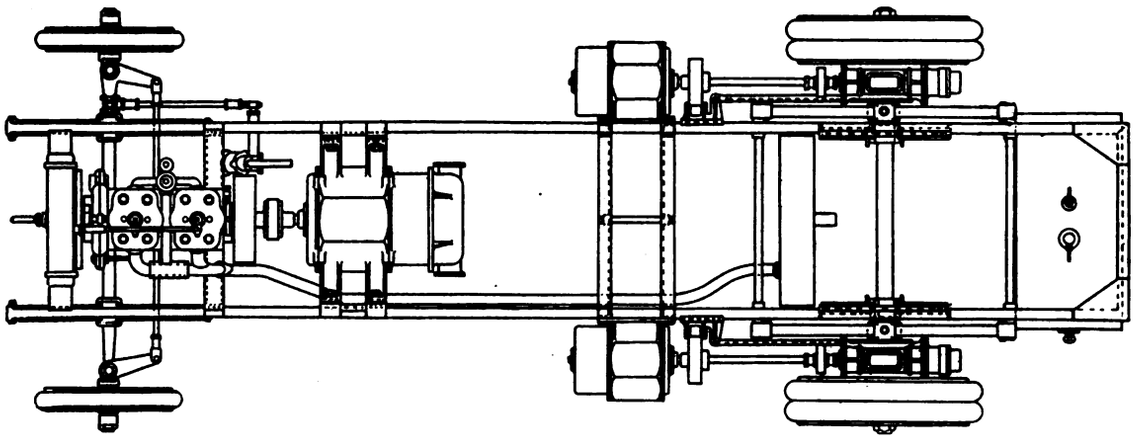

Plan View of the Latest Gasoline-Electric Bus—Motors Suspended Outside of Frame.

Gasoline-Electric Bus Development

Remarkable Constancy of Service Exhibited by a Vehicle Tested in Public Work for Four Months

THE development of the gasoline-electric vehicle is being pushed with all possible expedition by those who realize the importance of finding some satisfactory substitute for the slip-gear transmission so commonly used in motor buses. The expense of replacing stripped gears, not to mention the traffic losses incurred while the machines from which they have been abstracted are out of commission, is always high in a form of service calling for a great many stoppages, innumerable shifts of speed, and none too plentifully supplied with skilful drivers.

A large operating bus company recently undertook to try out a gasoline-electric machine which, on account of the high standing of the electrical firm which designed it, seemed to give promise of being very satisfactory. Four months' experience with the machine, which was commissioned to carry passengers in public service, would seem to indicate that as its weaknesses were discovered and remedied, it eventually established its reliability, the last 3,473 miles of its 10,480 mile trial being covered without occasioning the slightest trouble. Viewed in its entirety, however, the record of its performance is not so brilliant.

The possible mileage during the period of test was 13,390. Its actual mileage, as already stated, was 10,480. Analyzing the loss of 2,910 miles, it is found that 1,849 are to be charged against inefficient electrical equipment, the remaining loss of 1,061 miles being due to other mechanical troubles. Thus the loss due to the method of transmission was about 13½ per cent.

In extenuation of its mileage losses it must be said that the machine, which was not supplied with spare parts, developed most of its troubles as a result of faulty design in minor particulars, which, when remedied, gave no further occasion for criticism. The system of control, the commutator, the armature, the brushes, and many other features of the electrical equipment, gave no trouble.

This was the first time such a machine had been subjected to such a lengthy and severe test. It was operated by a driver who had no previous experience with gasoline-electric vehicles.

The plan drawing of the most recently designed gasoline-electric motor bus is shown at the top of this page. Its motors are placed outside the frame, and therefore they, and the worm gears through which they drive, are very accessible. This machine is regularly employed in public service. The final drive is by shafts from the motors to the rear wheels. The engine, rated at 30 hp., is coupled to a continuous current dynamo, behind which the controller is placed. The motors can be worked in series when the machine is climbing grades, or in parallel for ordinary work. The engine speed can be varied from 350 to 1,050 r. p. m., the latter being maximum speed. The fuel consumption averages about 8 miles to the gallon.

Six municipalities in England have just petitioned parliament for authority to operate motor buses within the territory under their control.

Most of the big London motor bus companies endeavor to limit the speed of their machines to nine miles an hour, but, as recording instruments are not attached, the drivers "hit her up" to 12 and sometimes 15 miles an hour. Specially constructed speed recorders are needed for these heavy vehicles.

During the recent holiday season toy motor cabs and wagons were in great demand in the European capitals.

A motor bus line is operating between Salem and Bennsville, Pa. The two points are six miles apart.

Berlin's only woman motor cab driver has quit her job. Twenty other women who endeavored to qualify for such work were rejected by the police, who test the fitness of all desiring to operate public service motor vehicles.

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New York's Motor Cab Service

Interesting Features of Administration Observed in the Operation of One Company's Machines

FOLLOWING the prevailing custom abroad, the drivers of the New York Taxicab Company's machines are paid no regular wages, but instead are allowed a fixed percentage of vehicle earnings. At present this allowance is 20 per cent of the gross receipts, and is available at the close of each day's work, minus the cost of fuel charged for at wholesale prices. The system has its advantages, particularly as it keeps all the operators alert for business and economizes in fuel. On the other hand, when work is slack and takings are low the higher earnings of busier days are needed in order to strike a fair average wage.

* * *

Half of the 300 machines ordered by the company from abroad are now in commission. The remainder are due for delivery on May 1. The temporary stabling of the equipment in a building in Sixty-second street will be continued until a modern cab garage can be erected on Fifty-seventh street between Eleventh and Twelfth avenues. Gasoline is measured out to each driver at 7 in the morning, report sheets being supplied at the same time. At this hour the cabs assigned to early duty take their place in front of hotels and railroad depots. Shortly before noon another batch of machines is chartered for work, and additions to the number are made at regular intervals thereafter until the full complement of service machines are in the streets. A small reserve is kept in the stable for emergency work. Whether as a result of the existing hard times, which puts the services of the rich man's chauffeur at a discount, or as indication of the profitable character of the driver's vocation, there are more applicants for the company's gray livery than there are places to be filled. Inspectors located at hotels and railway stations receive reports from the men at the end of every trip. There are no fixed working hours.

* * *

Although the daily travel average does not exceed 80 miles there are plenty of instances on record to show that machines have covered twice that distance between morning and night. It has been demonstrated that eighteen miles is the usual distance covered on a gallon of gasoline, the 18 hp. four cylinder engine fitted to all vehicles not being particularly economical in this respect. Drivers located at the choice stands clear from $25 to $50 a week. All repairs are effected at night, inspection being to some degree helped by the report cards of the drivers.

* * *

The pneumatic tires with which the vehicles are equipped are maintained under contract with the manufacturers, pay being exacted for service mileage and not for material. A representative of the contracting tire company keeps accurate account of the work done by all cabs as registered by the taximeter, the tires being numbered. Spare Stepney wheels are carried on all vehicles. In the case of a puncture the deflated tire is not removed. These spare wheels are well known and popular in English motor cab service, consisting of a tire fixed to a rim having clamps for ready attachment to the spokes. Interruption to service is avoided at any cost. An expert also has charge of the recording instruments.

* * *

It is a rule of the company that drivers must keep their engines smoking. This at least avoids the dangers of imperfect lubrication. By and by, when this class of traffic is more rigorously policed than at present, it is probable that some other method for compelling drivers to strictly attend to their duties will be found than one which permits them to make perambulating nuisances of the vehicles in their charge.

* * *

Daily vehicle earnings of the two New York motor cab companies are said to average between $30 and $35. Rainy days are the least profitable. This is considerably more than was anticipated at the outset. But deliveries from abroad are not being made with the promptness promised or expected. It is the scarcity and novelty of gasoline cabs which keeps present earnings so high. That and the work capacity of the machines at prevailing rates of 30 cents for the first half mile and 10 cents for each succeeding quarter or fraction thereof. Earnings must inevitably sink as the number of vehicles is increased.

THE COST OF HORSE TRAFFIC.

CHICAGO with its 4,226 miles of streets, of which 1,545 are officially described as "improved," annually expends $3,316,000 in a dismal bluff at keeping them clean. New York, which has 2,911 miles of streets, of which 1,809 are improved, spends $6,633,000 each year for the same purpose. Add to these huge sums the millions required for street maintenance and you dimly perceive what it costs to sustain horse traffic. To approximate it with any degree of accuracy, it would be necessary to marshal other statistics from all the populous cities of the country. Is it surprising that men ardently wish for an ideal form of minor transportation which will have for one of its least merits the elimination of this amazing extravagance?

The horse is undoubtedly the greatest economic nuisance the world has ever known. The commissioners of traffic in London have publicly declared that the vast sum of $939,000,000 is lost annually in that city alone through delays in street traffic, one third of which is traceable to the use of horses, one-third to inadequate streets, and the remainder to the congestion produced by surface railroads.

The gasoline-electric motor bus is to be tested by one of the Berlin transportation companies.

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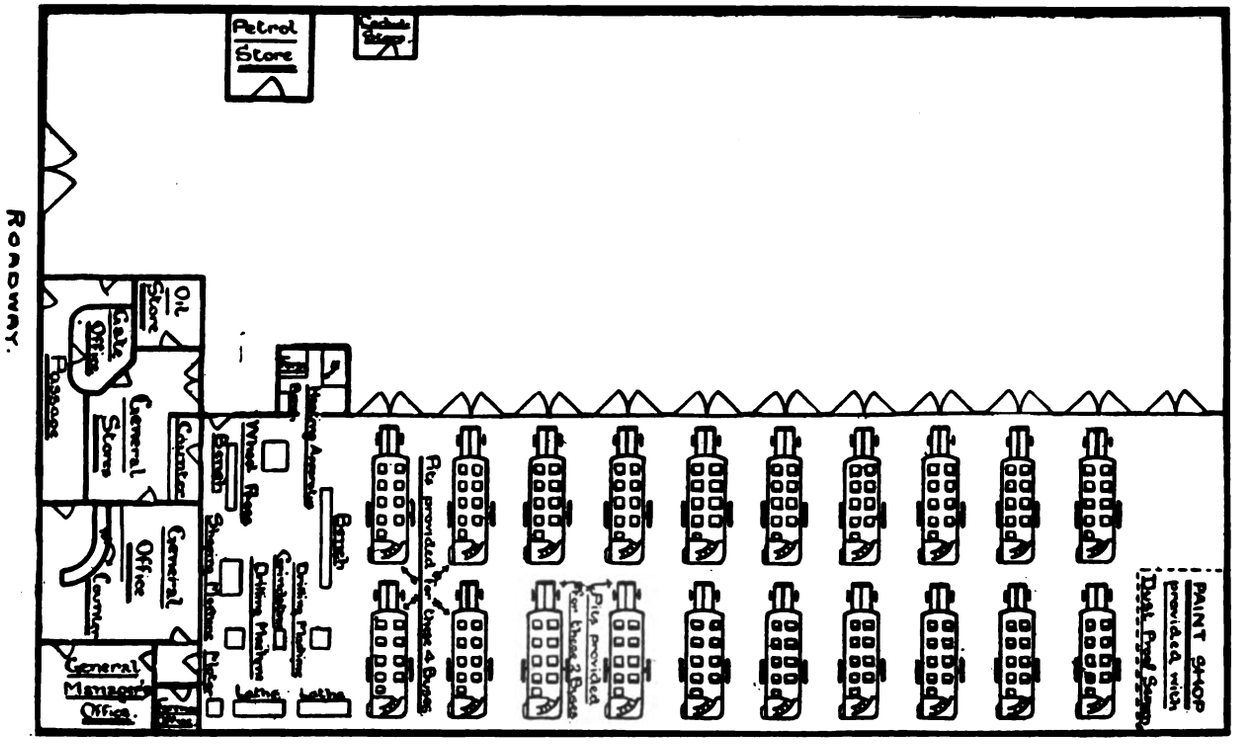

Plan of Garage for 20 Gasoline Motor Buses.

Model Motor Bus Company

Organization and Management of an Institution Equipped With Twenty Gasoline Units

SO many public service motor vehicle undertakings are in process of development just now that it becomes well worth while to reproduce a paper which was recently read abroad before a society of road traction engineers with the object of spreading enlightenment concerning the management, organization and working costs of an establishment wholly given over to the operation of such machines.

Although the author confined himself exclusively to the consideration of a gasoline bus installation limited to twenty units, it will be apparent that many of his observations may be usefully applied in the conduct of an establishment operating other types of vehicles. It will also be obvious that many of the practices described as suitable for a small establishment are, with certain slight modifications, available in the administration of a larger one. The necessity for picturing a model institution of some kind is sufficient excuse for the limitations which the author, a man eminent in the domain of electric street car engineering, imposed upon himself. His choice of an institution, containing twenty gasoline units is explained by his prediction that such installations are likely to be the standard in many places not metropolitan in character. An abstract of the paper is here presented:

The capital cost of a commercial motor vehicle undertaking can almost be regarded as a small matter compared with the cost of operating. A garage should be laid down, therefore, with the ultimate end of efficient and economical working, rather than the immediate saving of a few dollars in initial expenditure.

There are, no doubt, many other possible arrangements that could be made for a garage, but I think the plan I show will be found to be as convenient as any. In this case, the vehicles are placed ten abreast in rows of two, with sufficient space to enable them easily to turn in and out of the shed. The effect of this arrangement is to reduce the moving of the vehicles to a minimum, as, at the most, only one vehicle has to be moved to get any other out of the shed. This is an important feature, in view of the fact that for many reasons it is not possible to arrange the vehicles in the shed at night in the order that they should go out on the following day, and much time and expense may thereby be saved.

* * *

Arrangement of Shop and Offices.

The workshop is shown situated next to the office, and near the entrance to the garage, and is equipped with a suitable outfit of tools to enable the repairs to be carried out cheaply and expeditiously. In the diagram two lathes are shown, one small drilling machine, a shaping machine, a grinder, blacksmith's forge, and a wheel press for re-tiring. Pits are provided in the shed, under the four vehicles next to the workshop, to facilitate repairing and overhauling, and also under the third and fourth row for the purpose of re-blocking the brakes, etc., of the service vehicles, in case all the other pits are occupied by vehicles under repair. At the end of the shed is left a space that can be enclosed for the purpose of painting and re-varnishing the bodies.

The offices are situated next the road, and adjoining the workshop. The gate office is occupied by the time-keeper and store-keeper, as, being only a small system, the time-keeping and store-keeping can be attended to by one man. The oil stores are kept separate from the general stores, and workmen coming for different articles are served at the counter. The gate office has glass windows, so that the time-keeper can see people coming in any direction. Next to the general stores is the inquiry and general office, with doors communicating with the stores and the engineer and manager's office. Centralization of the offices, stores and workshop, means a considerable saving in time by affording

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facilities for direct and personal communication. Thus the engineer can at once enter the works or general office, while the clerks have immediate entrance to the stores, time office and shop. The foreman's office is between the workshop and the manager's office.

Near the gate to the shed, on the left-hand side going in, are the gasolene and filling tanks, placed clear away from the main building. The carbide store is just beyond the gasolene store, and here all generators should be recharged.

* * *

Entrance and Exit.

The procedure for the vehicles going in and out of garage is as follows: The night foreman should route vehicles for the different journeys for which they may be required on a blackboard which is provided for that purpose at the time-keeper's office. He should then see that all is ready on each vehicle for the driver to take over at reporting time; if one vehicle that is behind another has to go out first, then the front one should be run into the yard, so that there is a clear way out for the driver when he reports to take his bus. The driver should report twenty minutes or so before the vehicle is scheduled out, and the conductor some five or ten minutes before. In the case of the conductor, the reporting time is allowed for receiving tickets, punch, running times, and getting destination boards for the particular route on which his bus is scheduled.

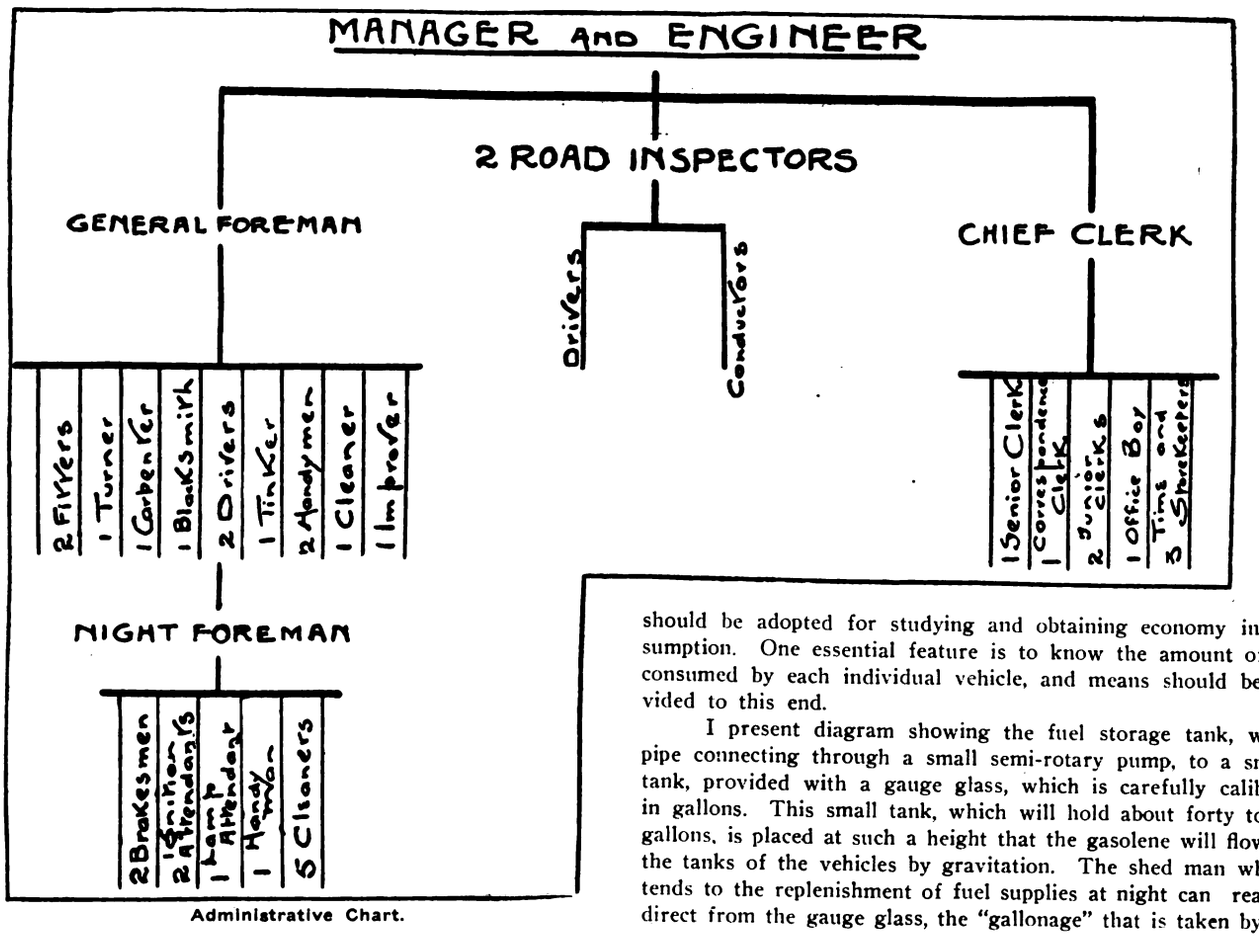
After the driver has booked, he refers to the bus output board, and then goes to the bus indicated, tries the brakes, sees that the oil tanks are full, oils the engine, and generally satisfies himself that the vehicle is in good condition for the road. He also goes through the tools and small spare parts which are carried on the bus, and satisfies himself they are correct with the list as shown on a form which he has to sign before leaving the garage, and which makes him (or the driver who brings the bus home) responsible for their safe return. As tools, when handled by a number of men, are most evasive articles, and as it is absolutely necessary that a driver should be supplied with all necessary tools to remedy a small defect on the road, or to do any adjustments that may have to be made, a system of some sort should be enforced so that a driver does not have to delay his bus for want of a spanner to adjust the brakes, or the right implements for getting at the carburetor jet or changing a sparking plug. This is of great importance. In the event of any tools being missing, the driver or drivers, as the case may be, are required to account for their absence.

The driver then starts his engine and takes his bus out of garage at the scheduled time. On returning at night the driver hands over his bus to one of the shed men at the gate, after having put out his lights and signed the log sheet for the vehicle or vehicles that he has been driving during the day. The shed man then replenishes the fuel supply, examines the tools, and backs the vehicle into the shed, so that it is in its right position for running out on the following morning. Of course if the brakes have to be re-blocked, it will probably be convenient to run it over a pit. It is not a bad plan for the man who examines the tools to seal up the tool locker on the bus with a lead seal, as it prevents the shed men from getting at these tools, and using them instead of their own.

* * *

Gasolene Storage and Consumption.

Probably the best method of storing the fuel is in a large tank buried in the ground. This should have an escape and a suitable indicator, the latter calibrated to read off the amount of fuel in the tank, according to the level. The fuel is then delivered, preferably by road tank wagon, which can be checked on a weigh-bridge for weight full and empty against the advice note of the supplier. By this means all handling of barrels is avoided, as the fuel can be emptied direct into the storage tank. This method not only saves considerably in labor, but it also very much simplifies the records. As the fuel bill on motor vehicles is one of the principal items of the running cost, every means should be adopted for studying and obtaining economy in consumption. One essential feature is to know the amount of fuel consumed by each individual vehicle, and means should be provided to this end.



Administrative Chart.

I present diagram showing the fuel storage tank, with a pipe connecting through a small semi-rotary pump, to a smaller tank, provided with a gauge glass, which is carefully calibrated in gallons. This small tank, which will hold about forty to fifty gallons, is placed at such a height that the gasolene will flow into the tanks of the vehicles by gravitation. The shed man who attends to the replenishment of fuel supplies at night can read off, direct from the gauge glass, the "gallonage" that is taken by each

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vehicle. The tally is left with the night foreman, who enters same on a quantity sheet together with the various lubricating oils and greases and sundry stores used for the day's work. The gasolene consumption, therefore, can be very carefully watched, and defects entailing high consumption remedied without delay. In many cases the individual driver can be checked, but it usually happens that more than one driver is on the same bus during the same day.

* * *

Percentage of Vehicles on the Road.

Having dealt with the general arrangement of the garage, we will consider the staff necessary to satisfactorily keep the vehicles in running order. One of the most important questions that has to be first decided is what average proportion of the vehicles it is advisable to keep on the road in everyday service. It is very nice to be able to say that one has ninety per cent of the vehicles on the road; but is this the right policy? It is, no doubt, quite possible to keep a very high percentage on the road when the vehicles are new, but a day of reckoning will surely come when this encouraging state of affairs will have to be paid for dearly in spare parts. In the example under consideration, namely, twenty buses, I am of opinion that if an average of thirteen are run per day, seven days a week, at an average of ninety miles per day, this will be found in the long run to be the greatest number that can be kept on the road consistent with efficiency, where a regular service has to be run daily. This number would, however, allow two or three buses to be kept in readiness for changing over and for special service, while the remaining five would be going through the hands of the day repair staff.

I am aware that thirteen is rather a small percentage to keep on the road, but I feel sure it would have the effect of providing the maximum number of buses for service on holidays and those days when the revenue per car mile is worth looking after, as in nearly all districts there are certain days and seasons of the year that have an important effect on the receipts of an undertaking whose business it is to run motor vehicles. With motor vans it is probable that the average percentage can be increased, but, even in this case, I think it is a mistake to try and attain a very high percentage. Motor vehicles must, and will, have great attention paid to them at the hands of thoroughly efficient men, and, unless this is done, expensive breakages will occur which otherwise might have been prevented.

Tool Sheet.

.....190.....

I hereby agree that I have taken over or returned with the bus in accordance with the position of my signature, all the following tools in good order:—

TOOLS.

1 Axle spanner.	1 Flat chisel.
1 Tank spanners.	1 Screwdriver.
5 Spanners, ¼", 13/64", ⅜", 7/16", ½", ⅝", ¾", ⅞", 1".	1 Pin drift.
	1 Piece copper binding wire.
1 Box spanner for sparking-plugs.	2 Oilcans (feeders).
	½gal. Oilcan.
1 Cycle spanner.	1 Fire extinguisher.
1 Hammer.	3 Cartridge generators.
1 File and handle.	1 Water can.
1 Pair flat pliers.	1 Tripod spanner.
1 Pair gas pliers.	1 Tin grease.

SPARES.

2 Spare sparking-plugs complete with joints and holders.	1 Governor spring.
	1 Inlet or exhaust valve spring.
2 Sparking-plug springs.	

Bus No.	Signature of Driver taking bus out	Signature of Driver returning bus.	Remarks.
No. 1			
No. 2			
No. 3			
No. 4 and so on			

I also present a table of the staff which appears to me would be necessary, but it does not include the secretarial department. Directly under the manager and engineer, on the engineering side, is the general foreman, who has control of all the shop and shed work, and to whom the night foreman is directly responsible.

* * *

Day Staff.

The day men are chiefly engaged on repairing, overhauling, and making examinations of the working parts. The drivers' log sheet reports, which are made when the vehicles come into the garage at night, are carefully gone through by the night foreman, and any repair necessitating more than slight attention is left for the day men to deal with. The chief men under the general foreman in the daytime are the fitters, and to these are entrusted the most important work on the chassis, and none of this work should be done by other men unless it is carefully supervised either by the foreman or one of his leading assistants. One turner, assisted by an improver, should be sufficient for all lathe and machine work, as the drilling machines would be utilized by many of the other men. The blacksmith, though mostly engaged at his forge, would also be available for undertaking, with assistance, the re-tiring. The tinker repairs radiators, lamps, floats, filters, pipes and tanks, and should have a convenient part of the shop apportioned to him for this work. The two drivers who are attached to the day staff can be utilized for repairing a bus when necessary, as well as for replacing drivers who may become incapacitated for any cause. As far as possible they should be employed in remedying defects which have been discovered on their own machines while on the road. With this system it is obvious that all drivers will in time reach a high standard of efficiency which will surely have its effect on the reliable running of vehicles. The carpenter, in addition to taking care of the coach work, could also assist in making other repairs. The duty of the day cleaner would include the thorough cleansing of each bus once every fortnight.

The question of how many miles a vehicle should run before it is brought in to be thoroughly overhauled, regardless of whether it appears to be necessary or not, is one which the manager and engineer have to decide. I expect a good many engineers have found out what damage may result from the floating about of a loose bolt in one of the gear boxes; also what an extraordinarily easy thing it is to get a loose bolt. I should place the necessary period for this examination somewhere between 2,000 and 3,000 miles. Both the change speed gear and the differential should be opened out for inspection, and special attention paid to all bearings, gears and bolts, and replacements made where necessary. The engine is probably the easiest portion of the chassis in which to detect any defect when in everyday use, but even in this case it is necessary to go thoroughly over the valves, circulating pumps, governors, bearings, and the big-end bearing-bolts in particular. Steering gear is also an important point. Valves on engine should be ground in, probably, about once a fortnight.

* * *

Night Staff.

An efficient night foreman, and a good staff of men are very essential for reliability in running. In the night the service vehicles have to be gone over and made ready for the next day's work, and, therefore, the various duties of the different men should be carefully assigned, and it is the greater part of the work of the night foreman to see that these duties are carried out. The night foreman, when coming on duty, must first carefully go through the log sheet reports of the drivers, and, in accordance with these reports, see that various items are attended to by those men who have to discharge that particular work.

Ignition Attendants.—Referring to the staff diagram, there are two men who are called sparking-plug or ignition attendants, and these men are responsible for the magnetos and igniters. The igniters should be examined every night, and thoroughly overhauled, cleaned and re-timed every three or four nights.

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The magneto must be examined and cleaned every night, with special reference to the rubbing contact. The switches also have to be cleaned, in order to insure a good contact. In addition to this, the igniters that are carried as spares must be examined for their fitness, and when a driver has reported that he has changed one of the igniters on the road this igniter has to be made good. Care should be taken to see that no faulty igniter is sent out the next day.

Brakemen.—All the brake blocks on hand, foot, and wheel brakes have to be taken up and adjusted every night, and the various brake pins and levers oiled and greased. Each brakeman is given a certain number of vehicles to do, but in the case of re-blocking the two brakemen would have to assist each other. In addition to this work the brakemen also have to examine chains (if vehicles are chain-driven), and boil and grease same when necessary. They also have to grease axles, differentials, and change-speed gears.

Lamp Attendant.—In the case of acetylene lighting, generators have to be re-charged every night, and paraffin lamps cleaned, trimmed, and re-filled.

Cleaners.—Each body cleaner should wash and clean about four buses per night. The engine cleaner should clean from six to seven engines, and fill all the radiators.

Oiling.—All oil cups and tanks should be filled by the handy man, who, when this has been accomplished, should assist the night foreman in any special small repair work that has to be done.

* * *

Daily Log Sheet.

Every man, both on the day and night staff, must sign the log sheet for the work he has done during day or night. For this purpose a daily vehicle log sheet is provided.

Under the heading "Report of Driver," the report of the driver is entered and signed. If two drivers are on the same vehicle during the day, each must sign the report. In the next column, all repairs are set forth and signed by the man executing those repairs. Every entry in the drivers' column should have a corresponding entry in the other column, stating what has been done with reference to any driver's report. In the column "Work done" is printed the various duties (which, of course, may differ somewhat according to the make of bus) of the night staff; and every man has to sign his name against his own particular work. By making the men sign in this way, a certain check is put upon their work and, moreover, the responsibility, in the case of any trouble, is definitely fixed, and the offender can easily be brought to book. The log sheets are signed by the general foreman in the morning, and laid before the manager and engineer, who can see the exact history of any vehicle per day. By filing the log sheets away in a suitable cover, the history of each vehicle is kept in a complete form, and one capable of easy reference. On the log sheet, space is also provided for recording tires, but this is more fully dealt with under tire records.

* * *

Training Drivers.

That the provision of thoroughly-trained and competent drivers is an essential factor for successful operating is a statement which it is almost too obvious to make. The greatest care should be exercised in their selection. At the present time, good, reliable, and experienced drivers are not numerous enough to be picked up at a moment's notice; in most cases, therefore, it is necessary to engage inexperienced men, and to train them. In the first instance, each man should be medically examined for physical fitness. If sound and possessed of good average intelligence, he can begin by making himself generally acquainted with the mechanism by traveling with an experienced driver, and reading up a simple text book, so that he gets some sort of insight into the general working. After a time he would be allowed to take hold of the handles, and gradually get into the way of driving, until he has become fairly proficient, and can be passed by the road inspector as capable of driving the vehicle. This part of his training will probably take at least a month, and he will, by that time, have appreciated what are the most important parts with which he has to make himself thoroughly acquainted. When, therefore, he goes into the garage, he will be able to make the most of his time, and will then more fully appreciate the importance of the various work he is set to do as part of his course of training. Very careful attention should be paid in teaching him the following important points:

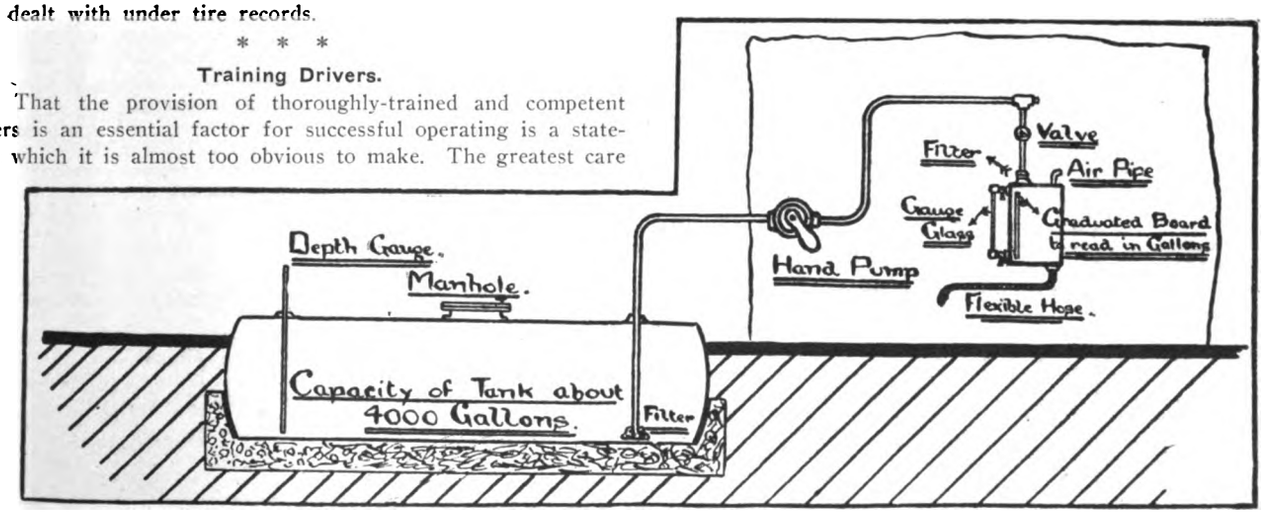
1. Method of taking up brakes (foot, hand and wheel).
2. Adjustment of clutch and clutch stop.
3. The changing and re-timing of an igniter.
4. The cleaning of contacts on magneto.
5. How to take carburetor to pieces and clean jet.
6. The detail in connection with pressure system (if gasolene is pressure fed).
7. The acetylene lighting.
8. The system of lubrication.

After about a month he would probably be pronounced by the shed foreman as having satisfactorily passed the practical training, but, before he is passed out as a competent driver, he should be made to go through a written examination in which the questions are framed on the work he has done. The written answers are filed with his papers, and form a record which might at some future time be very useful. We will presume that he has now satisfied his superiors, and that they have sufficient confidence to allow him to start driving. Any such new driver should be first of all placed on the easiest routes, and then gradually worked on to those which require the more skilful men. By periodically getting him back in the shed, as before described, by the end of the year he is a competent driver, and at the end of two years a really experienced man, who could be trusted to take a vehicle anywhere and almost any distance.

* * *

Road Inspectors.

The business of the road inspectors, besides checking tickets and making reports relating to traffic, should be to see that the drivers are carrying out their duties in a proper manner. For this reason the inspectors should be trained drivers, and thor-



Fuel Supply Installation.

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oughly acquainted with the work the driver has to do. They will then be in a position to report cases of reckless driving, the reason for a driver's not keeping time, and the nature of breakdowns, and they would also be a great help in remedying small faults that may occur on the road.

* * *

Clerical Staff.

Without going into details, I will briefly indicate the various duties of the clerical staff as follows: Chief clerk, attends to all ordering and accounts; senior clerk, tire mileage and traffic records; correspondence clerk, all correspondence, filing, etc.; junior clerks, tickets and general assistance.

The time-keeper and store-keeper, whose offices could be combined, attend to the men's time and deliver all stores. There is always one of these men on duty day and night. No stores should be given out unless a proper order is received, duly signed by some authorized person.

* * *

Spare Parts.

It is very essential to keep a good stock of spare parts, and the most careful attention should be paid to the obtaining of correct sizes. Speaking generally, I believe that makers, as a whole, have scarcely yet realized that by supplying spares at a reasonable cost they would not only keep this portion of the trade in their own hands, but would greatly assist bus owners in keeping down expenses, thus encouraging the use of the machine they sell. I think I am right in saying that the great majority of spare parts purchased to-day by the London operating companies are obtained from firms which are not bus makers. While a large operating company can obtain considerable advantages by buying spares from these concerns, small operators generally have to buy from the makers. This evil will no doubt right itself in time. In fact the lull in motor bus manufacture has already caused a reduction in the cost of spare parts.

Tire Records and Mileage.

Records of tire mileage require to be kept with the greatest accuracy, particularly if purchases are made on a mileage basis. For this purpose a space is provided on the daily log sheet for noting the numbers of the tires on each vehicle, and also for recording any changes that may have been made during the period covered by the log. These records should be checked each day against "tires issued from stores," for when a tire is issued it is either put on a wheel that is on a bus or on a spare wheel. The check prevents the possibility of a change without notification.

The daily mileage is ascertained from the bus mileage sheets turned in by the conductors, who must record the number of journeys made on each route on a sheet corresponding with the number of the bus. The mileage clerk having been supplied with the tire numbers, and the mileage run by each bus every day, can therefrom make up the mileage of tires for each week in a special ledger, and the tire makers can be furnished with a weekly statement of the mileages and failures of the individual tires.

* * *

Cost of Working.

One of the most necessary points, which should be verified at the outset, is the mileage of each route, and probably the most satisfactory method of ascertaining this is to measure the route with a pedometer. This should be done in the presence of a representative of the tire makers, so that any question as to the route mileage, which might arise later when the mileage of the tires does not come up to the maker's expectations, is once and for all settled.

One of the chief duties of the clerical staff should be the getting out, every week, of details of the receipts and cost of running, and the various books and records should be so framed as to enable this to be done with as little trouble as possible. As the weather, in most districts, has a bearing on receipts, it is

DAILY LOG SHEET. BUS NO. ....

ROUTE..... TIME OUT.. ..... TIME IN ..... FROM 10 A.M..... TO 10 A.M.. ..... 190...

ROUTE..... TIME OUT.. ..... TIME IN.....

Report of Motorman.	Repairs Executed.	By Whom	Work Done.	By Whom
			Petrol Tank filled	
			Oil Tanks, Cans, etc., filled	
			Radiator and Water Tanks filled	
			Diff. Gear Case oiled and greased	
			Change G'r Case oiled and greased	
			Grease Cups filled	
			Axle Caps oiled and greased .	
			Cardan-shaft Joints greased	
			Rack and Pinions greased .. .	
			Generators charg'd, Lamps trim'd	
			Bus cleaned	
			Igniter Plugs examined	
			Ignition overhauled	

Tyres.	Front.		Back.			
	Left	Right	In.	Out.	In.	Out.
Present No.						
Nos. changed from						
Where taken from						
Time off						
Time on						

Brakes adjusted { Hand . / Foot .. / Wheel ..

Signature of Foreman.....

Daily Log Sheet.

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interesting, for future reference and comparison, that this should be recorded, and a column against the daily receipts is provided for this purpose. There is nothing more likely to assist efficient administration and economical working than facts brought forward as cash.

Having now got a blank cost card to suit the small system under consideration, it seems somewhat incomplete until it is filled in. I shall endeavor, therefore, to arrive at the working costs, and in doing so, I shall presume that the motor buses are of the latest type, and built from the experience obtained on the earlier models.

The various items of cost are considered in detail, and full particulars given as to how the figures are reached. Such items as the price of gasolene and labor vary appreciably in different districts. So also, do the conditions under which the buses have to operate differ: it may be in a flat, or it may be in a hilly, district; it may be through congested traffic, or on open country roads. In working out the costs, I have endeavored to strike a medium for an English district, and I believe the figures given would only vary very slightly for the different localities.

It will be remembered that an average of 13 vehicles are in daily service, and each vehicle runs on an average of 90 miles per day. The mileage for a week, therefore, works out at 8,190 miles.

GASOLENE.—

Taking the price of gasolene at 16 cents per gallon for .760 spirit, and that a vehicle runs 5.75 miles on a gallon		$228.00

CARBIDE, GREASE AND OIL.—

Acetylene lighting, 13 buses would use 130 lbs. of carbide per week at 4 cents per lb.	$5.20	
Cartridge papers, 200 per week, per 100	.72	
Lubricating oil, taking 1 gallon to every 150 miles' run	19.80	
Grease, 72 miles per lb.	6.49	
		32.21

TIRES.—

Mileage contract, at 4 cents per mile		327.60

DRIVERS AND CONDUCTORS.—

To arrive at this cost, it is necessary to approximate the average speed: I put this down at 7.5 miles per hour, which includes waiting and reporting time. Paying drivers at 15 cents per hour, and conductors at 11 cents per hour, the amount comes to	$286.80	
Allowance for uniforms	8.40	
		295.20

TICKET CHECK.—

2 inspectors at $9.60	$19.20	
Uniform allowance	.60	
Tickets (50,000 at 9 cents per 1,000)	4.50	
Punch rental (45 at $2.88 per annum)	2.40	
		26.70

ATTENDANCE BUSES.—

Under the heading of attendance comes nearly all the work of the night staff, and while they may execute some work which is in the nature of a repair, so also may the day staff do some work which might be allocated to attendance. For the purpose of this paper, I have put all the wages of the night staff under this heading, and, assuming the men work 56 hours per week, this is made up as follows:

Night foreman (weekly wage)	$10.80
2 brakemen, at 13 cents	14.56
2 igni$ter attendants, at 12 cents	13.44
1 handyman, at 12 cents	6.72
5 cleaners, at 9 cents	25.20
1 lamp attendant, at 11 cents	6.16
	$76.88

Material, including water, rags, waste, paraffin, brushes, soap, etc.	9.60	
		86.48

ATTENDANCE GARAGE.—

3 time-keepers and store-keepers, 8 hours per day, at $6.60 per week	$19.80	
Heating apparatus	1.80	
		21.60

REPAIRS, CHASSIS (including engines).—

Wages of the day staff, with exception of carpenter, are included under this heading, but foreman's salary comes under salaries. 56 hours per week:—

2 fitters, at 17 cents	$19.04	
1 blacksmith, at 16 cents	8.96	
2 drivers, at 15 cents	16.80	
1 tinsmith, at 16 cents	8.96	
1 turner, at 16 cents	8.96	
1 improver, at 8 cents	4.48	
2 handymen, at 12 cents	13.44	
2 laborers, at 11 cents	12.32	
1 cleaner, at 10 cents	5.60	
	$98.56	
Material, including replacement of spare parts, calculated at 2 cents per mile	163.80	
		262.36

REPAIRS, BODIES.—

1 carpenter, at 16 cents per hour	$8.96	
Material, including paint and varnish	9.60	
		18.56
REPAIRS, BUILDINGS AND TOOLS.—(Estimated)		14.40
LIGHTING AND POWER.—(Allowance)		9.60

SUNDRIES.—

Printing and stationery	$12.00	
Advertising	4.80	
Cleaning offices and sundries	4.80	
Petty cash	4.80	
		26.40

RENTS, TAXES AND INSURANCE.—

Fire and ignition risk on buses	$432.00	
Insurance or amount set aside for third party claims	3,360.00	
Inland revenue licenses	374.40	
Workmen's compensation; wages	144.00	
Fire insurance on buildings and stock, say	30.00	
Rates and taxes	320.00	
Licenses (gasolene, carbide, police licenses for buses, drivers and conductors)	34.80	
Telephones, fidelity guarantee, etc., say	110.40	
1-52nd of	4,805.60 =	91.20

SALARIES AND MANAGEMENT.—

Engineer and manager, per annum	$2,060.00	
Clerical staff, per annum	2,400.00	
General foreman, per annum	873.60	
1-52nd of	$5,333.60 =	104.48

DEPRECIATION.—

The amount to be set aside for depreciation should really come in at the end of the year, but in order to make costs complete it is necessary to put amount in cost card. It will be remembered that these buses under consideration are of the latest models, and that mileage run does not average more than 21,000 per annum, and, therefore, if it is correct in most cases to reckon depreciation at 25 per cent, in this case 15 per cent should be an ample allowance. Even after 7½ years, the vehicles should be worth something, so that if their whole value is depreciated in this period 15 per cent should be a very fair figure. Assuming, therefore, that each vehicle cost

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$3,840 without tires, the amount set aside for depreciation, for 20 vehicles, is.....	$11,520.00	
Depreciation of buildings, at 2 per cent...	288.00	
Tools and office furniture.....	180.00	
1-52nd of $11,988.00 =		230.54
Total		$1.775.33

By inserting the foregoing figures in the cost card, and by following them out for the 52 weeks in the year, and filling in receipts at 24 cents per mile, the profit amounts to $9,716.72. From this must be deducted the amount set aside for the sinking fund, the expenses of the secretary's office and the fees of the directors. There should, however, be sufficient left to pay a fair return on the capital expenditure, which would be somewhere in the neighborhood of $120,000.

Now, it will be seen that the total working costs, including depreciation, come out at 90 per cent of the total receipts, and herein lies the difficulty, to my mind, of the advance in the more general adoption of motorbuses.

* * *

Reduction in Working Cost.

The cost of working must, therefore, be reduced, and the items which are capable of being worked on to bring about this reduction are: Gasolene, oil, grease, carbide, tires, repairs, attendance, and insurance.

Gasolene is probably, at the moment, the item most capable of reduction. By careful management, coupled with the latest improvements, I think that the figure put down on the cost card can be made to show a marked decrease. Lubricating oil, while not such a large factor, is still a considerable item of expenditure, and by use of the most suitable oil, and by careful economy, the oil bill should be very considerably lowered.

Tires may be described as the "dead weight" of the motor omnibus, pulling it down all the time. The tire makers are the most likely to be able to say whether there is any prospect of a reduction in the near future. It would be most interesting to know their views on the subject.

Repairs and attendance, according to my figures, when added together, come to 4½ cents per bus mile, which certainly seems a large amount, but it will be some time before gasolene buses are perfected so as to allow any considerable reduction in the number of men to keep them in order and repair. On the other hand, the price of spare parts is sure to come down, so that a saving may be anticipated in this direction.

Insurance, or the amount set aside for third-party claims, is largely a question of tires. As soon as the skidding propensities of the motor vehicle are diminished, the premiums will be reduced. The skill of the driver is no doubt being improved by experience, but the fact remains that, given a certain state of the road, skidding is likely to occur, and, until a long-mileage, non-skid tire comes into universal use, the insurance companies' premiums will be high.

In the course of the critical discusison which followed the reading of this paper, it developed that 13 working buses out of an installation of 20, was too small a proportion if the machines selected were of the latest type. Expert opinion favored keeping 17 out of 20 actively employed, which would have the effect of greatly increasing the mileage and traffic receipts. If this could be accomplished, and there is little doubt of it, the weekly mileage of 17 out of 20 machines would amount to 12,000, instead of 8,150 miles for 13 out of 20. The higher mileage is the present record of the best buses in the best services.

With the corrected mileage a profit of about $20,000 per annum could be shown on the investment of $125,000.

One member of the society before which the paper was read declared that he knew of a responsible company which was prepared to take a contract to supply omnibuses in London with gasoline and lubricating oil, to provide tires, to do all repairs, to wash and clean them, and to write off depreciation, for 13 cents per mile. Furthermore, new chassis would be supplied in place of old ones at the end of five years.

The estimated expense for clerical work was sharply criticized. It was the general opinion that if a London bus garage was conducted on such lines the manager might expect to get fired. In London buses run 140 miles per day, 98 per cent of the schedule of work, and 20 per cent of the vehicles are held in reserve. That means averaging about 78 per cent of the total possible work, but even then it is not possible to get the costs down so low as those quoted in the paper.

American operators will at once recognize in this contribution to the literature of motor bus management, the defects peculiar to the local conditions which inspired it. The low fare and the high cost of fuel would, with us, be exchanged for high fare and low fuel cost, which would still further swell the profits: On the other hand, wages would be higher with us, but probably not so much higher as to seriously affect the balance sheet. On the whole, therefore, it appears that where intelligence guides the management of a motor bus service, and the traffic can be depended upon, it represents a distinctly profitable form of investment which, analytically regarded, is not without its lessons for those who employ any considerable number of motor vehicles for the transport of merchandise.

CAB TIRE EXPENSE.

WHEN gasoline motor cabs were first put on the streets of New York there was some inclination to exaggerate the cost of pneumatic tire maintenance. As time goes on, however, it becomes evident that months will elapse before this item of accounting is regarded as a very important factor in determining profit in operation. At present the cost of maintenance is almost negligible, one company whose tires are fitted to 25 vehicles declaring that for the first 4,000 miles of service it did not exceed 20 cents per tire for the distance given.

It is impossible to think that this low initial expense will remain constant as service is prolonged. Increased mileage will inevitably produce an increase in tire wear, which will eventually reach a point where total replacement becomes necessary. Then, and not until then, will it be possible to say whether the cost of tire maintenance is greater or less than was calculated at the outset. The cost curve, once started, cannot descend. That much is certain. To what height will it rise before a level indicating annual maintenance is reached? That's the problem. The records available at this moment do not assist in solving it.

Milwaukee is to be supplied with a motor police patrol wagon. An appropriation of $4,000 has been made for its purchase.

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BATTERY CARE IN ELECTRIC BUS SERVICE.

AS the success or failure of electric bus service depends very largely upon the nature of the care given to batteries it will be instructive to observe how one of the companies operating such machines administers this important branch of work. Its battery report card follows:

BATTERY CARD.

BATTERY NO..... DATE,.....190..

Time left Garage.....a. m. / p. m. No. Round Trips.....

" returned.....a. m. / p. m. " Half " .....

ROUTE.....

Voltage out (full speed).... Amps.... Voltage in....Amps.

If returned to Garage before making full number of trips scheduled, state reason, and exchange this card for a new one.

Give details of any Battery troubles mentioning trip number:—

.....

.....

.....

.....

Bus No..... Driver.....

Above to be filled in by Bus Driver and handed to Battery Attendant immediately upon entering Garage.

Put in Bus, No.....at.....a. m. / p. m. Taken out at.....a. m. / p. m.

CONDITION OF BATTERY WHEN RECEIVED:—

Warm Connections..... Leaky Jars.....

Broken " ..... Acid low in Cells No. .....

General Condition of Battery and Crate.....

.....

WORK DONE.	CELL NOS.	TIME TAKEN.
Acid added	.....	.....mins.
Acid adjusted	.....	..... "
Connections replaced	.....	..... "
Cells cleaned	.....	..... "
.....	.....	..... "
.....	.....	..... "

Quarts { Acid / Water } used.....

Acid readings taken..... Voltage readings taken.....

Remarks.....

.....

CHARGE.

TIME.	AMPERES.	VOLTS.	TEMP.	S. GRAV.
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....

.....

Battery Attendant.

With such reports in front of him the man in charge of the battery department thoroughly understands what is necessary to be done in order to increase the power plant efficiency of any given machine. He has precise information concerning the road behavior of each vehicle, which in turn indicates the efficiency of each driver. Being familiar with the service and shop record of each battery in the establishment he can intelligently proceed to stop any loss arising from mishandling. As a result it becomes a comparatively simple matter to guarantee a high standard of road service efficiency.

Where such records and reports are lacking there is generally much unnecessary complaint of the work capacity of service vehicles. Evidently, then, there is a positive science in the administration of electric machines, which it is necessary to master before their highest economy can be realized.

This establishment does not assume to know as much about the treatment of storage batteries as their makers. Accordingly the battery makers are made responsible for the maintenance of their part of the equipment, with the result that it is always in a state of efficiency. Every electric vehicle expert knows that it is the quality of the attention given to a battery which determines its efficiency and durability. The treatment must be expert. Much valuable information is gathered from service report cards like that presented below:

The Mexico City Motor Cab and Omnibus company has been formed with capital stock of $50,000.

Motor bicycles, with side car attachment, are used by the Austrian postal authorities in the collection of mail in Vienna.

The city of Hamburg has purchased an electrically propelled fire escape. The machine weighs four tons and at top speed travels 10 miles an hour. The wheel base is 120 inches and the track 48 inches.

To avoid the splashing of mud, all four wheels of the Paris motor buses are now fitted with leather guards which, suspended from frames that clear the street curb, extend close down to the surface of the roadway.

The electric ambulance employed in the service of the Jefferson Medical College Hospital in Philadelphia, is rated at 1,000 pounds load capacity. The top speed of the machine is 15 miles an hour, and 40 miles is obtainable from a single battery charge.

The Union Pacific's design of gasoline rail cars are now operating on sixteen roads. One car now runs on the Erie out of Cleveland. Another makes daily trips in California. A fourth carries passengers on the Alton, and fifth makes daily runs between Galveston and Houston. One is in service between Lawrence and Leavenworth, Kans. The Northwestern operates one between York and Fremont. Another carries passengers between Kearney and Callaway, Neb. Two run between Denver and Cheyenne, and three more are in service on Colorado railroads.

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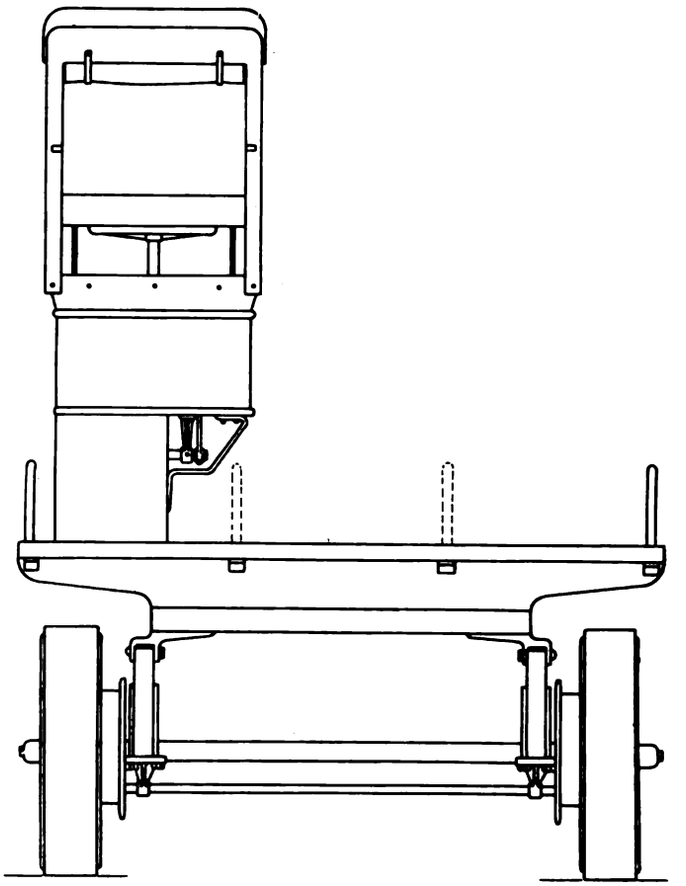
MOTOR BUSES ON THE TEXAS PRAIRIE.

FIVE motor buses are operating between Lubbock and Plainview in the Panhandle district of Texas, making the 45-mile trip in three hours. The machines carry mails as well as passengers. Until lately, this route was covered by horse-drawn stages.

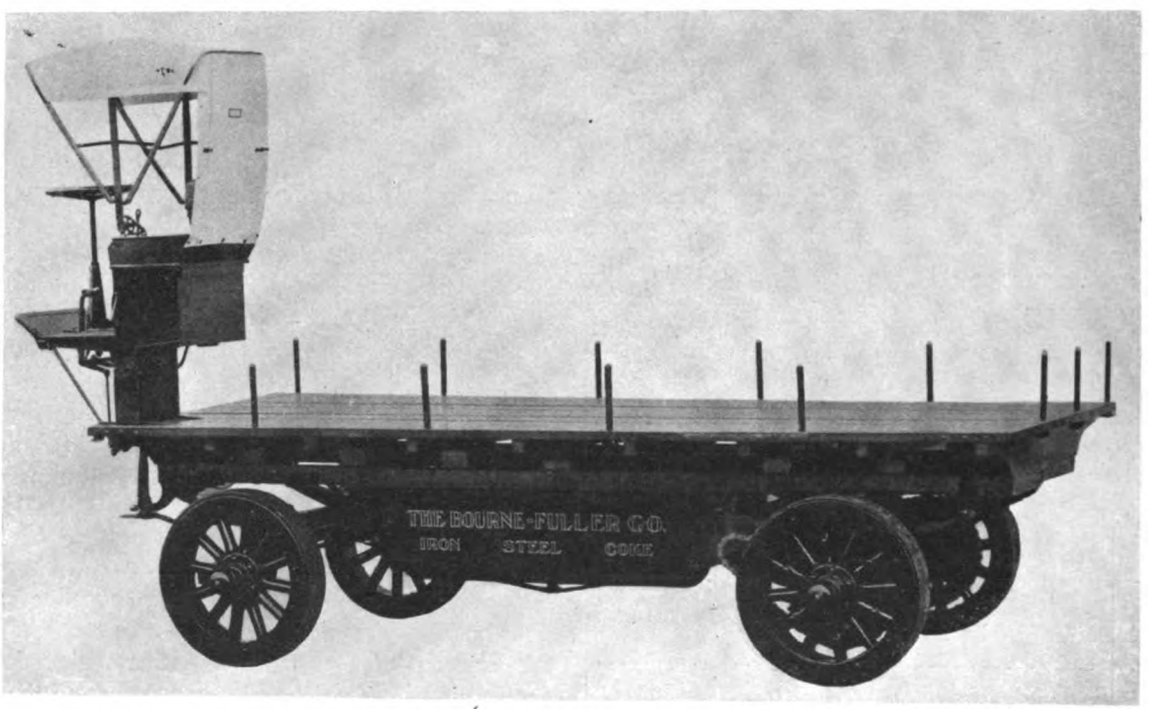
The cost of the round trip of 90 miles is $10. The proprietor of the line gets $50 a day for carrying the mails, one machine being set apart for this work. The cars are fitted with 24 hp. engines and very wide tires. Sand is plentiful in that region. A well equipped machine shop and plenty of spare parts are found at the Lubbock end of the line. The profits of operation have been so large that the extension of the service to Big Springs, one-fourth of the way across the state, is now being considered.

A luxuriously appointed theater bus is operating in Chicago. It has capacity for 14 passengers and is equipped with electric heaters, electric lights and a mechanical music player.

Next May trials of motor buses and motor cabs will be held in Hungary for the purpose of determining which model of each class is most desirable for use in Budapest, the council of which city has decided to substitute motor vehicles for horse-drawn buses and cabs. Money has been appropriated for the purchase of a large number of the machines which are successful in the trials.



Front View of Wagon Shown Below.



Heavy Electric Truck with Wood Tires.

A short time ago the Bourne-Fuller Company, of Cleveland, Ohio, purchased two heavy-duty Studebaker electric trucks which were especially designed for carrying iron and steel in bars, sheets and strips. The activity of the service planned for these vehicles, not less than their large loads, led their owners to decide upon the use of wood tires. One of the machines pulls a 3½-ton load. The other hauls 5 tons. In both the driver's seat is placed at the extreme left of the platform, thus giving unusual room at the front for overhanging lengths of the material transported. Both trucks are equipped with platforms of ample dimensions, and their beds are partially lined with sheet steel to prevent wear.

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THE MOTOR HEARSE.

COURAGE and common sense are conspicuously lacking in the Pittsburg undertaker who denies place to the automobile in funerals upon the ground that nothing can equal the dignity and solemnity of a procession in which horses take part. It is needless to say that in this opinion he is not very heartily supported by his brother professionals.

"Can you imagine an automobile procession moving at a funeral rate of speed?" he inquires.

Why not? Isn't three miles an hour slow enough? Besides, funeral processions often proceed much faster.

"Another objection," he goes on to say, "would be the greatly increased expense if automobiles were used for such purposes. If the hearse is motor driven all the vehicles in the procession must be automobiles to insure a uniform appearance. Of course no one would want to hurry the procession to save money on such an occasion. The very idea is repulsive and disagreeable."

There is every reason to believe that the funeral road procession of the future will consist of less vehicle units than at present, and be very much less expensive in consequence thereof. There is nothing indecorous about the speed of a funeral car operated on rails, nothing repulsive or disagreeable about its equipment. Why, then, should it be regarded as bad taste to urge the use of motor road vehicles in similar service?

The fire department of Council Bluffs, Ia., is investigating the utility and economy of motor propelled fire apparatus.

Many of the grape growers of Sonoma county, California, use motor vehicles for hauling the fruit to near-by market points and railroad depots.

New York now has two motor police patrol wagons, one gasoline and the other electric. The gasoline machine is attached to the West Forty-seventh street station. The electric serves the new Tenderloin station in West Twentieth street.

One day last month a "runaway" electric bus, employed in public service in Philadelphia, was considerably damaged in front when its progress was checked by a granite post in Fairmount park. Its driver was at lunch when the machine started on its unguided course.

RULES FOR FRENCH TRIALS.

RULES to govern the 1908 commercial motor vehicle contest of the Automobile Club of France have just been formulated. Eight classes will be formed, namely: Class 1, machines rated to carry from 100 to 400 pounds; class 2, carrying from 400 to 1,800 pounds; class 3, carrying from 1,800 to 3,000 pounds; class 4, carrying from 3,000 to 4,000 pounds; class 5, carrying from 4,000 to 6,000 pounds; class 6 carrying over 6,000 pounds; class 7, public service vehicles carrying from 6 to 10 passengers; class 8, public service vehicles carrying more than 10 passengers.

The maximum axle load is fixed at four tons. No speed above 12 miles an hour will be allowed for classes 1, 2, 3, 7 and 8. For classes 4, 5 and 6 the top speed is fixed at 9 miles an hour. The final standing of all competing machines will be fixed under the following formula:

$$\frac{T \times C}{P \times D}$$

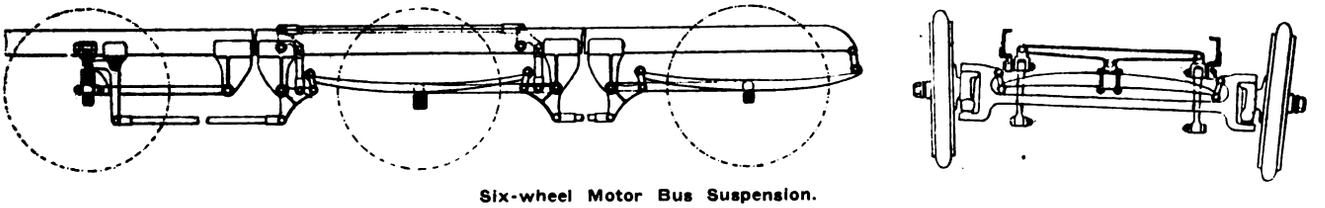
T represents time in hours, C the cost of fuel consumption throughout the trials, P the useful load carried, to which will be added the weight of the body, and D distance covered.

It will be permissible to change certain spare parts at will. Certain other parts, which will be stamped, must not be replaced except by duplicate parts officially stamped, and of which each competing machine will be allowed to carry a limited number. The replacement or repair of all other parts is prohibited. The use of pneumatic tires is barred. Replacement of rubber tires or elastic wheels is also forbidden.

It is proposed that the trials shall be similar to those recently held in England, the competing machines making a tour of France and visiting all important industrial centers in the course of 25 days running, beginning April 25, closing with a consumption test and inspection of mechanism. The entry fees are as follows: Class 1, $60; class 2, $100; class 3, $150; class 4, $200; class 5, $300; class 6, $300; class 7, $200; class 8, $300.

Vehicles in classes 1 and 2 will not be permitted to use pneumatic tires.

The city of St. Louis is erecting a garage for the machines it employs in public service.



Six-wheel Motor Bus Suspension.

The above drawings indicate the construction of the six-wheel suspension used on the steam-driven buses employed in Paris. The majority of engineers are not willing to allow any decisive mechanical value to the middle wheels, although they readily concede that such equipment, by affording better distribution of the load than can be gained by the use of four wheels, very probably will tend to keep tire expense low. They also admit that wear due to unrelieved frame and axle stresses is likely to be diminished by the use of a third set of wheels.

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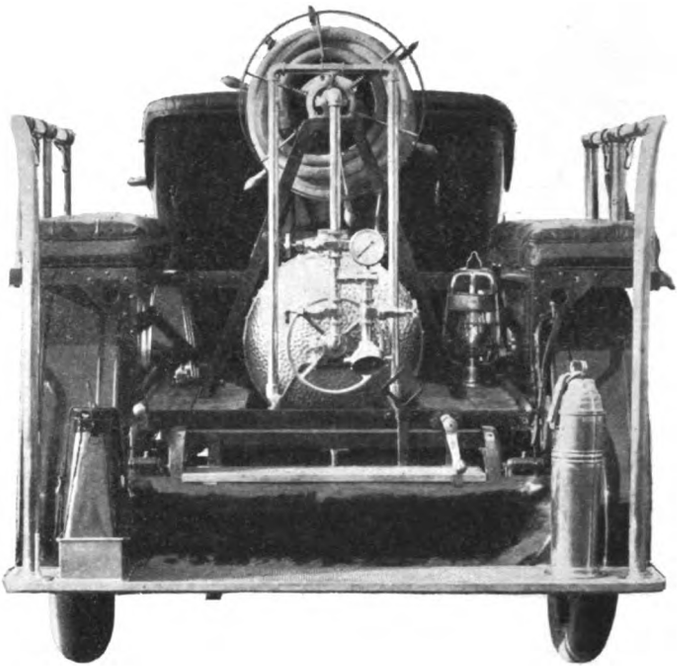
GASOLINE ELECTRIC CABS.

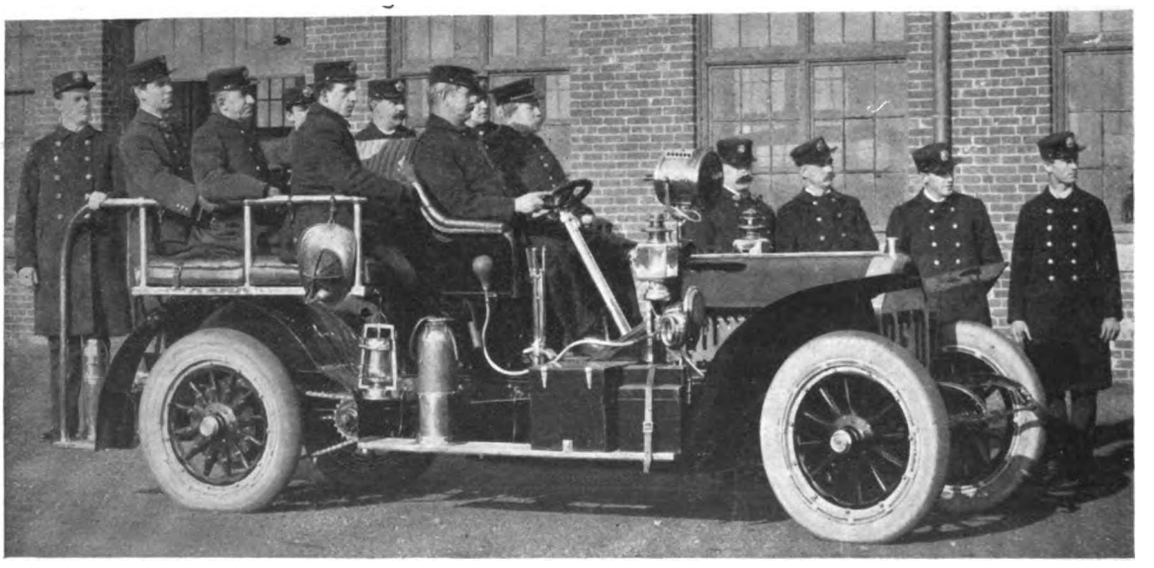
EVERY attempt which has been made to operate large numbers of gasoline public service vehicles has resulted in severe criticism of the transmission methods employed. The drivers, being recruits from the horsed cab or bus business, have found difficulty in shifting gears without stripping them, and the frequency with which they are called upon to perform this operation, and the effect its clumsy performance has upon the service and the maintenance account, has led the vehicle proprietors to give attentive consideration to any form of transmission which would obviate loss from such a source.

A French motor cab company believes that the solution of the problem lies in the employment of gasoline-electric machines, in which the range of the gasoline cab is combined with the smooth operation of the electric. A number of these vehicles are now being put on the streets of Paris. They are somewhat less expensive and more quiet in operation than the gasoline cabs, and their service commands better rates than that of other motor cabs. The engine, of 12-16 hp., has four cylinders and is coupled to a dynamo. The engine drives the dynamo which supplies current for the two motors, located in the front wheels. The dangers of side slip are largely avoided by this method of front wheel driving, but this advantage is offset by the greater difficulty of steering.

During the past year considerable progress has been made in the development and application of the gasoline-electric system of transmission. Although a good many wagons, buses and touring cars of the "mixed" type have been made in this country and abroad, none of them has been in service sufficiently long to afford opportunity for judging how their economy compares with that of the straight types of either kind. Their greater weight and complication of design are by many held to overbalance whatever advantages they possess over rival types. However this may be, their claim to present notice rests upon the transmission principle employed, which eliminates the change speed gear troubles peculiar to the majority of gasoline vehicles, and permits smooth acceleration. This, however, the friction disc drive also accomplishes, and with much greater simplicity.



Rear View of Bridgeport, Conn., Motor Chemical Engine.



Motor Driven Chemical Engine Used in Bridgeport, Conn.

High speed and substantial engineering are the two leading features of the motor driven chemical engine recently supplied to the Bridgeport, Conn., fire department by the Locomobile Company of America. The motive plant of the vehicle is a 60 hp. four cylinder engine. The transmission, of selective type, gives four forward speeds. The drive is by side chains. The total weight of the vehicle is 4,200 pounds. The equipment consists of a 50 gallon chemical tank, hose reel and hose, small hand extinguishers, crowbars, axes, etc. The crew consists of eight men, but when necessary ten may be carried. In order that no time may be lost at night when a fire alarm is sounded the machine is fitted with an electrical apparatus for lighting the acetylene headlights from the seat. At all times this vehicle will be run at highest speed, the Bridgeport fire department being firm in the belief that property losses are more frequently due to tardiness in reaching the scene of action than to inefficient methods used after the fire has gained headway. The chassis is the regular Locomobile design, amplified and strengthened.

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ADVERTISING SIGNS ON MOTOR BUSES.

SOME sensitive souls in New York recently complained to the police that the advertisements displayed on the outside of the motor buses plying on Fifth avenue, were offensively obtrusive. The police thereupon attempted to suppress the alleged nuisance, but were very promptly enjoined from doing so by the courts.

Advertisements are not regarded as objectionable when placed within public service vehicles. If, however, they are so conspicuous when hung outside as to obscure the destination signs, they are manifestly improperly placed. It does not apepar that the complainants raised objection on this score. They merely profess to be shocked that advertisements of any kind should be paraded along a fashionable thoroughfare.

An electrically operated tricar was exhibited at the recent Berlin industrial motor vehicle show. It is guaranteed to cover 50 miles on a single battery charge, carrying 250-pound load and traveling at 16 miles per hour. The machine is listed at $700.

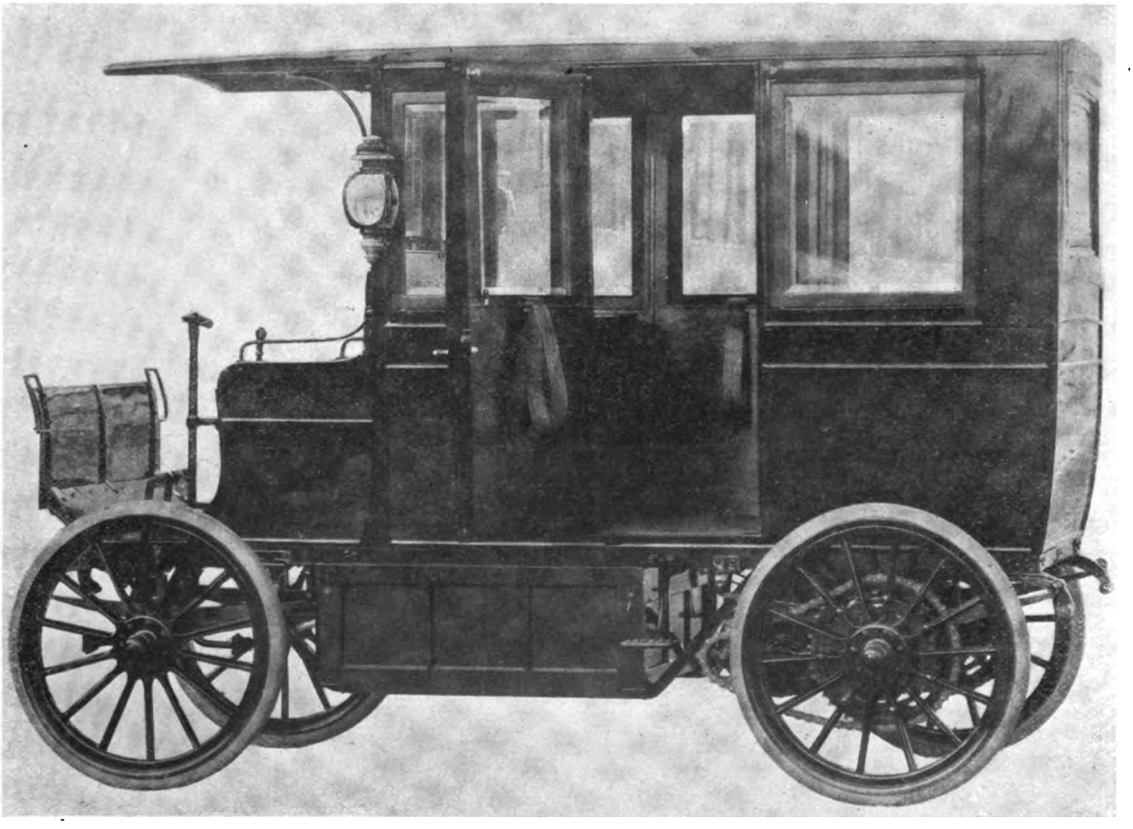
TAXICAB COUPON BOOKS.

THE latest wrinkle in motor cab administration is the issuance and use of a coupon book, which is sold for $9.50, representing a 5 per cent discount.

This device for attracting and holding custom has been brought out by the New York Taxicab Company. The books are on sale in the hotels which the company serves. Purchasers get a half-mile ride at 28 cents, instead of 30 cents, the cost of succeeding quarter miles being 9½ cents instead of 10 cents.

For four years past motor fire vehicles have been used in Paris. They have proved so serviceable and economical that the city authorities recently decided to purchase three additional motor fire engines.

A company with capital stock of $300,000 is being formed in London to haul general merchandise by means of power wagons. The engineer of one of the large motor bus companies is to have charge of the mechanical branch of the service.



Money Wagon Operated by St. Louis Bank.

The National Bank of Commerce of St. Louis recently put into commission a very interesting electric wagon built by the Studebaker company. The chassis has 1,500-pound load capacity. The body was built to the bank's specifications. In the rear of the driver's seat, extending under it and wholly inside of the body, is located a strong box made of wood and lined with heavy sheet steel. This is divided into five compartments and fitted with a lock. Inside the body, in the rear, extending across its full width, is a seat for the person in charge of the wagon and the officer or guard. The inside dimensions of the body are: Length, 6 feet 8¼ inches; width, 40½ inches; height, 57 inches. The wagon is used for carrying money between the bank and sub-treasury, and also between the offices of various express companies. When a customer wishes to pay off in currency, the money is carried to his place of business in this wagon under the protection of a guard. There are times when the machine transports over 9,000 pounds of money between different parts of the city in one day. With a 1,000-pound load the wagon has a radius of forty miles and a speed of twelve miles per hour. The vehicle is equipped with two motors, each of 80 volts and 14 amperes rating. The battery equipment is 44 cells of 9 m. v.

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MOTOR BUS OPERATORS STRIKE.

ABOUT eight hundred motor bus drivers and conductors employed by one of the London operating companies went on strike recently because the company, perceiving that the men were in the habit of "soldiering," insisted upon paying by the journey instead of by the day.

The company's policy, which is that of the majority of the metropolitan bus operators, was devised with the object of eliminating the men who, when a breakdown occurs, loaf instead of hustling to alleviate the resulting public inconvenience. Ostensibly the strike was ordered because the hours of work would be longer under the new policy, which fixes the hour wage at 17 cents for drivers and 12 cents for conductors. Heretofore the daily wage for drivers has been $1.75, and $1.20 for conductors. The company proposed to pay full wages up to the moment when a breakdown occurred, and stand-by pay from that time on until the disabled vehicle was again operating, the driver drawing 12 cents an hour and the conductor 9 cents an hour. When the disabled machine got back to the barn the driver was to have the option of aiding the repairing force and continuing to draw 12 cents an hour, or resting at his own expense.

One of the first results of the strike was the paralysis of the company's traffic, for the balance of its 1,400 operatives threw down their tools out of sympathy for the drivers and conductors.

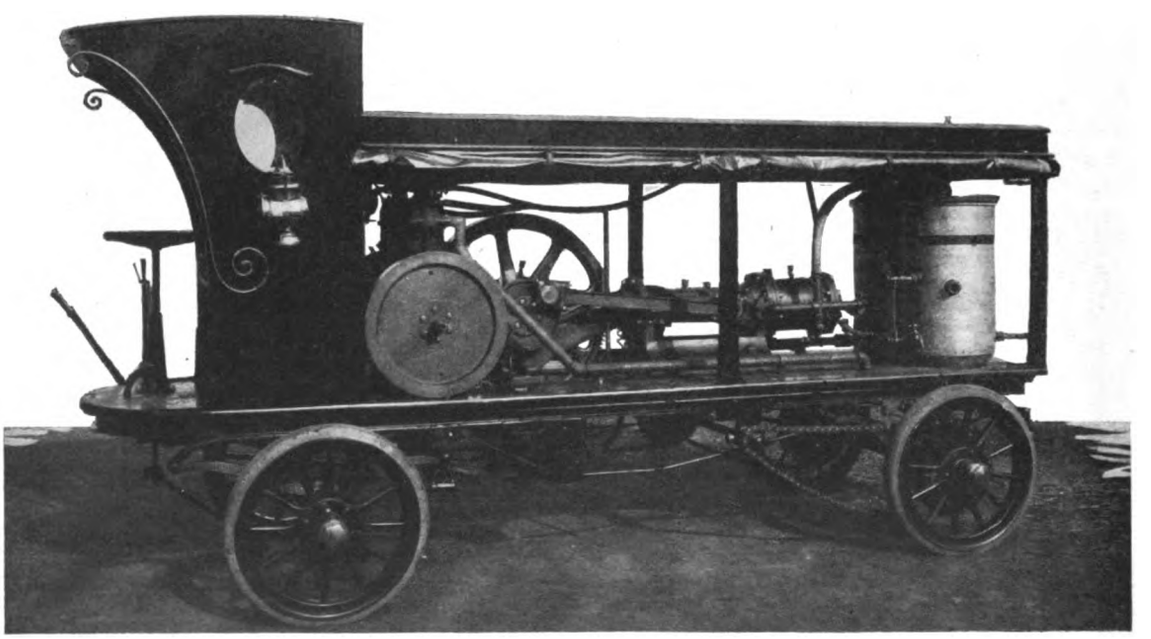
The chief objection to the journey payment plan is that it assumes the machine to be perfect and its driver something of a rascal. All the machine's weaknesses not yet having been discovered or overcome, it is not considered good judgment to pay fixed day wages while breakdowns are likely to occur through contributory negligence on the part of drivers.

It might be possible to apply to motor bus operation a system which works helpfully on many interurban trolley lines. The drivers on these lines are paid a fixed wage when enrolled. Close physical inspection of the car and an examination of the record card suggests whether the driver is to earn the approval or displeasure of his employers. For certain lapses there are certain penalties, expressed in demerit marks. When the sum of these demerit marks reaches a certain figure the driver is, at the option of the employers, given smaller pay or else discharged. Meritorious service is also marked, and when the sum of such merit marks has reached an appointed figure the driver's pay is raised. This system has the advantage of accurately charting each driver's professional service. It clearly distinguishes the men who are habitually negligent from those who are only occasionally culpable.

In considering the two systems for determining the wages of motor bus drivers it should be borne in mind that experience shows the loss of time due to roadside delays is 50 per cent greater when men are paid by the day than is the case when they are paid by the journey.

Two Pittsburg undertakers are considering the employment of motor-operated hearses, similar in design to the machine used by a Brooklyn funeral director.

The Russian war department has ordered the formation of a military automobile corps, with the German corps as a model.



Portable House Cleaning Plant Having Auxiliary Uses.

This multiple-use machine is mounted on an automobile chassis. Its road speed is limited to 10 miles an hour. Its twin cylinder vertical engine develops sufficient compressed air to operate all the riveting hammers and drills that would be in use at any one time in the construction of a skyscraper building. This makes the machine useful for steel construction work, sand blasting and paint spraying, for which it is used when not house-cleaning. It is made by the Vacuum and Compressor Co., of Toledo. The steel frame is U-shaped.

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Long Distance Motor Trucking

Comparison of The Advantages of Single Wagons With Machines Which Pull Trailers

THE importance of long distance motor trucking has not escaped the watchful eyes of experienced road transportation executives.

G. W. Slingerland, formerly general superintendent of the New York City district of the American Express Company, and for many years holding positions of responsibility in the National Express Company, has organized the Mutual Transfer Company, of which he is president, to operate motor trucks in long distance service on season or trip contracts. The company's purpose is to provide merchants, market gardeners and others with regular or special delivery service in New York, New Jersey and Connecticut.

It is expected that the company will make use of trailers, as it has been well demonstrated that such auxiliaries to motor wagon service are distinctly economical. This enterprise suggests a comparison of the service afforded by a motor wagon which carries a large load on its own platform and in addition thereto pulls a load on a trailer, and a tractor which caries a light load on its platform and pulls heavy loads on trailers. Under what circumstances should a heavy duty motor wagon be employed when the alternative is the use of a tractor and trailor? This interesting question, so far as it affects the use of steam vehicles of either type, is answered by a foreign contemporary, the Industrial Motor Review, in the following manner:

A tractor is seen to the best advantage on bad ground, or where it is desired to use several trailers in relays. In brickfields the roads are seldom of such a nature that the gross weight of a vehicle passing over them can be ignored. The total weight of a tractor or of a trailer is approximately 6½ tons—13 tons together. This gross load is carried on four pairs of wheels, and can be divided into two entirely separate portions at any time. The steam wagon weighs 5 tons without load, and 11 tons with a six-ton load; or, if a trailer is used with it, three tons may be loaded on the wagon and four tons in a trailer. The gross moving weight of the fully-loaded wagon is six tons, and of a partly-loaded wagon and trailer 13½ tons, which may be increased to 15½ tons by putting another ton load on both the wagon and the trailer. Whether the steam wagon be used with or without a trailer there is never less than a gross moving load of nine tons, and if fully loaded 11 tons. The effect 11 tons weight is likely to have on a yielding road is easy to imagine. The steam wagon under load might very soon become buried up to the axles, whereas the loaded trailer of a tractor, 6½ tons—the heaviest part of the equipment—might pass over the ground with impunity. Tractors are, furthermore, usually provided with a winding drum and steel hawser for pulling a trailer over bad ground without itself passing. Steam wagons, of course, are also fitted with winding drums, but that would not obviate the necessity of the heavy-loaded wagon itself passing over the treacherous soil.

What has been written with regard to bad ground in brickfields applies also to every condition of mechanical road transport where it is desirable to distribute the load over as many wheels as possible with a minimum gross weight to each unit of the transporting medium. The tractor has a further advantage over the steam wagon in its ability to economize loading and unloading time. By using relays of trailers, a tractor can be kept continually running without the necessity of long stops for receiving or discharging its load. The steam wagon, even with a trailer, must necessarily remain idle while the wagon load is being taken on or off. Certainly, the wagon can use relays of trailers also, but that does not more than minimize the loss of time waiting for or discharging loads by 50 per cent.

On the whole, a tractor is more powerful than a wagon as regards ease in dealing with loads, because the total moving weight of a tractor and trailer fully loaded is about three tons less than the total moving load of a steam wagon with 10-ton load on a first-class road.

The steam wagon, however, easily scores over the tractor when the total possible load is considered. Many steam wagons are made with a platform carrying capacity of 6 tons and with a trailer capacity of 10 tons. No tractor can carry more than 5 tons load without infringing the law as to tare weight of trailer, or running the risk of a breakdown by carrying more than five tons on a 3,000-pound trailer. The trailer might certainly be made of steel, but then the cost of the outfit would be more than the price of a steam wagon and trailer. Again the steam wagon scores by having a better road adhesion than a tractor, owing to its tractive weight being in exact proportion to the general contour of roads. On setts and greasy rising ground the adhesion of a tractor to the road surface is not nearly sufficient unless wood tires are provided, and it is still a moot point as to whether the extra cost of the wood tires and renewals is in proportion to the better work obtained.

In congested traffic centers the steam wagon is particularly desirable, owing to the fact that it can carry on itself a load of six tons—one ton more than a tractor can legally trail—and does not occupy more space than the tractor itself. The consequent greater maneuvering power of the steam wagon makes it a great favorite in London, Liverpool, Birmingham, Manchester, and other cities. Then there is the question of available space for maneuvering in the warehouses or wherever the steam wagon may have to load or unload. Backing a trailer is not always an easy feat where the area for maneuvering is restricted. A steam wagon can back without any preliminary into any space constructed to accommodate only a horsed van. Smart and precise backing can be accomplished by tractors, as was evidenced during the recent trials, but a steam wagon is considerably handier.

Steam wagons without trailers require no more than two men, and can even be run by one man. Tractors usually have to carry a steerer as well as the driver, and also a brakeman on the trailer, although the latter may be dispensed with if the trailer brakes are operated automatically with the tractor brakes. Seldom, however, is a tractor and trailer left to one man, although it can be legally done.

Many of the points here developed may be made to apply in comparing the usefulness of any type of power whole problem. The most reputable machine might easily fail to make a good showing if it was applied in service of mechanical transport. Adaptation to service is the wagon with any type of tractor. This is no "best" method for which it was unsuited.

The purchase of a $2,400 motor patrol wagon is being urged upon the authorities of Joliet, Ill. By selling six horses, worth $250 apiece, the municipality would only lack $900 of the sum required to buy the machine, which amount it is confidently expected will be saved within a year from the time the machine was installed.

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Pneumatic Tires of the Future

It is Predicted That Heavy Vehicles Will Be Fitted With Air Tires Made With Segmental Tread of Metal

MUCH money has been spent by manufacturers in the difficult task of developing an economical tire suitable for very heavy motor vehicles, such as motor buses weighing, with load, in the neighborhood of seven tons and traveling at a speed of not less than 12 to 15 miles an hour. Reviewing what has been done, and speculating upon what may yet be accomplished, a writer in Motor Traction, a trans-atlantic contemporary, says:

It may be assumed that given a motor bus with tires as resilient and comfortable and as silent in running as those fitted to the modern motor car, many of its present troubles would be eliminated, and antipathy and prejudice would quickly disappear. This desideratum at the moment only seems possible by the adoption of the pneumatic tire in proportion to and of a size suitable for the increased weight of the vehicle, but the enormous cost and risk of puncture and side-slip seem to render it impracticable, and the solid rubber tire has been almost universally adopted as giving the best all-around results at a minimum of cost in maintenance and upkeep.

But rubber in itself is incompressible. Any advantage in its employment is only gained by its elasticity and displacement of part of its bulk in any given direction. It also acts as a buffer and to absorb vibration. It is only the portion standing out from the rim edges that possesses any elasticity or displacement, the remainder within the rim merely acting as a buffer to absorb road shocks. A great defect is the compression of a small portion of rubber always in front of the wheel, caused by displacement, and as this cannot travel round the wheels owing to the rigidity of the tire with the rim, it has perforce to slip back underneath, thus causing friction between the tire and the road. This is one main reason for the comparative slowness of solid rubber tires as compared with the pneumatic, as in the latter the compression is free to travel round the whole wheel's circumference, and may even possibly assist in the propulsion of the wheel instead of retarding it.

Supposing the pneumatic tire were adopted for the motor bus, a sectional diameter of, say, 8 inches, 10 inches, or even 12 inches would be necessary, and the initial cost of rubber treads and mainenance would bcome prohibitive and impracticable. But is rubber really necessary as a covering for road contact? The inner air tube could be increased in thickness, and would absorb all road shocks and give all resilience necessary. It is generally pointed out that the enormous cost of the pneumatic tire of today is accounted for largely by the quantity of rubber used in the outer cover, but it would appear that in the case of a heavy vehicle, such as a motor bus, this outer covering, from the point of resilience or as a shock-absorber, is of little practical value, and might find a substitute in a cheaper material for a covering. Canvas is cheap enough, and if some material of this sort could be found that was waterproof and possessed of a fair amount of durability, it might be advisable to renew cheap covers every few weeks rather than use an expensive commodity like rubber. The idea of cheap covers often renewed is at least worth consideration.

As regards liability to puncture, improvement in road construction would do much, and segmental elastic puncture-proof bands to protect the inner air tube could be devised that would be effective for a heavy vehicle where excessive sped is not essential.

One peculiarity of the pneumatic tire is the fact that the greater the body of matter placed between the compressed air and the road surface, the slower and less resilient the tire becomes. This is outside all considerations of the total weight that might be supported by the tire. A tire with a thick, strong outer cover has the tire walls more or less rigid, and no part of the tire tread can be depressed without a pulling strain being put upon or applied to the contiguous portions of the tire walls around the wheel or tire circumference.

In a light cycle tire this is inappreciable, but in large sections and stout constructions of the covers necessary for heavy vehicles it becomes a serious factor, and the "life" or "give" of the tire is seriously affected. Leather outer protectors for tires with metal studs and similar devices still further counteract the resiliency and other advantages of the pneumatic principle.

It follows, therefore, that the tire walls require to be as flexible as possible, and the tire tread or periphery to be of a segmental character to obtain the best results, if this could be done without affecting the advantages of the present type. In this connection it is interesting to note that many tires patented and applications for patents recently embody the principle of a *segmental periphery*, which is a huge step in the right direction.

A segmental tread will allow of the present advantages of the pneumatic principle being retained, and at the same time secure a strong and durable *yet flexible* covering for the main air tube. This is merely an elaboration of the idea which led to the introduction of the corded tire and other cover improvements.

I have no hesitation in stating that a segmental periphery, owing to the facts pointed out, will lead to radical changes being made in strong pneumatic tires suitable for the motor bus, and that the pneumatic tire of the future for all heavy vehicles will be designed on these lines.

The pneumatic principle is the correct one for all vehicles mechanically driven, but increased durability and decreased initial cost and maintenance are imperative considerations for heavy industrial vehicles. Rubber and canvas are too perishable, costly, and unreliable to hold the field. Radical departures are called for in tire walls and treads, and as invention is rife, heavy pneumatic tires will be revolutionized within the next few years.

A combination of pneumatic and solid tires minimizes risk of punctures and bursts, secures a narrow tread, ensures reliability, and has other advantages. Some of these combinations are excellent in their way, and fulfill many claims made for them, but they lose in speed. They are useful for vehicles in which reliability is everything and mere speed a secondary consideration. As a general rule, they are expensive. All tires combining pneumatic and solid principles would also be improved if fitted with a segmental tread, each part being easily detachable and replaceable in case of wear. Some have been so made, and must of necessity possess more "life" or resiliency than the continuous tread types or ordinary solid tires.

There is hope for a mechanical pneumatic tire, and it will assuredly be introduced for heavy vehicles before many years are over. The principle involved will probably be the retention of compressed air, but with segmental tread of metal, each segment bearing directly on the compressed air chamber within, the latter being sufficiently away from the road as to render the possibility of punctures an unknown quantity. The piston principle with compressed air stuffing boxes, each piston or set of pistons being connected with a segment of road tread, is worth serious consideration as a possible solution of the motor bus tire problem.

The sum of $625,000 for motor postal service has been granted by the Bavarian government.

The board of fire commissioners of Hartford has advertised for bids for a new motor ambulance to replace the old electric machine which has been in service for almost seven years.

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SUPERIORITY OF THE MOTOR POLICE WAGON.

IN police service motor wagons are very much more cheaply maintained than horse wagons.

Towards the close of last year the police authorities of Springfield and Holyoke, Mass., made a thorough investigation of the relative cost of operating both forms of service. It was found that the annual expense of the Springfield motor wagon amount to $349, while the maintenance of the Holyoke horse drawn vehicle cost $534. The record of the motor wagon, which has been in service for two years, is as follows:

Number of miles run during the year	6,336
Total number of runs for two years	5,435
Total number of miles run for two years	11,514
Cost of gasoline and oil for one year	$152.23
Average cost per mile for gasoline and oil, one year	.024
Average cost per mile for gasoline and oil, two years	.025
Cost of repairs for one year	421.22
Average cost per mile	.66
Total expense, including all outlay for repairs, gasoline, oil, etc., for two years	880.05
Average cost per mile for two years	.076
Average cost per run for two years	.16

Near the close of the season a new set of tires was placed on the machine at an expense of $181, which is included in the expense account, but which should figure in the expense account for the next two years; deduct this amount from the expense account of the last two years and the amount will be $699.05

Or an average per mile	.06
Average per run	.12

ELECTRIC MACHINES IN GERMANY.

AT the Berlin industrial motor vehicle exhibition electric machines for light service were in the numerical ascendant. Very few heavy duty gasoline or electric models were shown.

There is a strong demand in Germany at present for electric commercial vehicles, particularly for the smaller units. This accounts for the development of the electric tri-car which is now making its appearance in two forms, front and rear wheel driving, the former having a motor in the leading wheel and the latter driving through bevel gears. Such machines sell at $700 and are exclusively used for package delivery, with loads not exceeding 300 pounds. Their radius is 50 miles on a single battery charge.

Motor buses are to be operated between Dandridge and Jefferson City, Tenn. A fine pike road connects the two points.

The Munson Steamship Co. and the Quaker Steamship Line have decided to admit gasoline wagons to their New York piers. In a short time it is expected other pier owners will abandon their policy of exclusion and extend equal privileges to all motor vehicles.

AS TO DRIVERS.

IT is always in order to inquire if commercial motor vehicle drivers can be successfully recruited from the ranks of horsed vehicle drivers. Until recently it has been impossible to give a decisive answer to the question. This was not because many examples indicating the ease of such conversion were lacking, but because they were not sufficiently impressive to register public opinion upon the subject. It has been necessary to wait for the time when a hundred or more horse drivers had, in a mass, been suddenly ordered to assume the higher responsibilities of driving motor vehicles.

One express company has in its employ almost 300 motor wagon drivers who, till a few years ago, drove horses. Their skill in performing present duties is frankly acknowledged by the company to be even higher than when they were otherwise employed. So much for the flexibility of labor which is assigned to handle electrics.

Nearly all of the gasoline motor bus drivers and a large percentage of the gasoline motor cab drivers were knights of the whip. They have been recruited for their new tasks in large numbers. Of the former a London paper which has closely observed their behavior has this to say:

"The skill of the old horsed bus drivers quietly jogging their way along the crowded Strand was for long the admiration of all who saw it. But it pales before the skill which the motor bus driver has developed with such extraordinary rapidity. He may be reckless sometimes and run things too fine in racing with his fellows; but as a rule, he drives amazingly well, and the public certainly will not wish to see him treated otherwise than with fair consideration."

Were it necessary the testimony of thousands of commercial establishments could be produced to show that the change of occupation under consideration has been accomplished with great satisfaction to both parties in interest. Labor is a very flexible quantity. It can always be expected to exhibit a characteristic which distinguishes the human family, namely, the desire to make progress. The most casual study of anthropology confirms this opinion. Development, however, is frequently arrested by other causes than are inherent in the thing to be developed. For example, millions of men are driving horses because they are not encouraged or given opportunity to drive motor wagons. Most of us are molded to our duties. The molders in this case are the employers. Doubt of the ability of a horse driver to manage a machine is, therefore, an impeachment, not of the man, but of his master.

The signal whistle for foreign motor cabs has a very peculiar and penetrating note.

To quell the disturbance which occurred when motor cabs were introduced into Cairo, Egypt, it became necessary to summon military aid. The horse cab drivers furiously resented the novelty and endeavored to destroy the garage.

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Wagon Maintenance

Tips to New Drivers and Caretakers About Things Likely to Escape Their Attention

PREVENTION is better than cure. This is the season when all vehicles with internal-combustion engines require extra attention in respect of the water contents of their radiators, cylinder-jackets and pumps, together with the connections thereto, and all of these should, where the storage building is not artificially heated, be completely drained each night. Failing this precaution, the expansion of the water on its solidification will certainly be the cause of considerable expense, for it is no small matter to purchase a new cylinder casting, and it is immensely annoying to have a radiator which is like a sieve. One other matter in connection with an internal-combustion engine is the difficulty which arises, on cold and frosty mornings, in starting the engine. The well-known practice of squirting a little gasoline through the compression-cock does not always avail, and in the case of such failure we recommend drivers to swathe the induction pipe in hot cloths.

* * *

Lack of Electric Wagon Mileage.

If an electric vehicle shows a decrease in speed, or an insufficient mileage, the running gear and the motors should be examined carefully before blaming the battery. A comparatively simple and usually quite sufficient way to locate the trouble is to examine the current consumption as shown by the meter. If it is greater than normal then the trouble is with the mechanical parts, and the vehicle should be examined for that. If the current consumption is not abnormal then there might be either poor connections or some deficiency in the battery. A notable decrease in the capacity of the battery can have many causes, and it is not always quite easy for a person who has not had great experience with storage batteries to find the right one. A certain number of troubles can be quite easily located by an inspection. Such are: a dry cell in which the electrolyte has leaked out through a broken jar; sulphated plates, due to the fact that the battery has been overdischarged and kept standing in a discharged condition; the sediment which collects normally at the bottom of the jar may have come up to the plates and caused short circuit. It is not possible to say exactly when the sediment in the normal case will reach the plates, as this depends very much upon the way the battery is used and the care it receives. It is preferable to have the battery washed before any short circuits, through excessive sediment, have been caused, but under no condition should a cell with the sediment up to the plates be kept in service. The sediment should be removed. If it is not possible to locate the trouble by an inspection, then the cells must be connected in series and discharged at the normal rate. The discharge rate should be kept constant, and while the discharge progresses frequent voltage readings at the battery terminals should be taken. As soon as the battery begins to drop in voltage noticeably, individual voltage readings of each cell with a low-reading voltmeter, and specific gravity readings, should be taken frequently until the majority of the cells read 1.75 volts; those reading less should be noted. The battery should then be put on charge again, and after the charge is completed the low cells should be cut out and examined. In most cases it will be found that the electrolyte in the low cells is low in gravity, and that the plates have a more or less whitish appearance, which indicates that they are, to a certain extent, sulphated. An overcharge for forty-eight hours at about one-quarter of the normal rate will tend to reduce the sulphate, but if during the charge the temperature of the cell should rise above 100 degrees F. the charge should be stopped or continued at a still lower rate until the temperature falls. In cases where the deterioration of the plates has progressed so far that this method does not give results, a special electro-chemical treatment has to be used which requires the facilities of a storage battery factory.

* * *

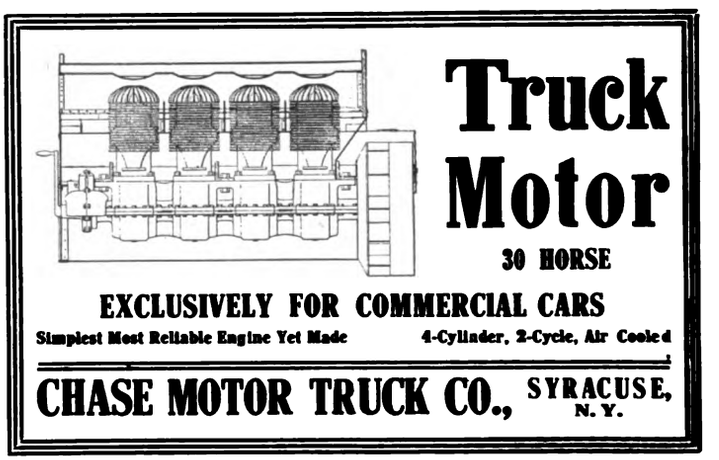
Anti-Freezing Solutions.

Each of the various anti-freezing solutions has its peculiar virtue—calcium chloride, glycerin, wood alcohol and some of the crude oils. In the opinion of the majority, however, wood alcohol is the most satisfactory solution. It is efficient, and does not attack either solder or rubber. A 40 per cent solution, that is 40 per cent alcohol and the balance water, will stand a temperature as low as 20 degrees below zero. For ordinary use a 25 per cent solution, which stands a temperature of about zero, will be found sufficient.

* * *

Starting on the Spark.

It is an error to suppose that the ability of an engine to start on the spark is an evidence of good compression. The Lenoir engine, a non-compression motor, takes its charge during the first half of the downward stroke of the piston. The inlet valve then closes and ignition takes place, the force of the explosion driving the piston the other half of the way. On return the gases are exhausted and the operation is repeated. There is an impulse every revolution, as in a two-cycle engine. It will be seen that the engine works on a half cylinder charge of non-compressed gas.



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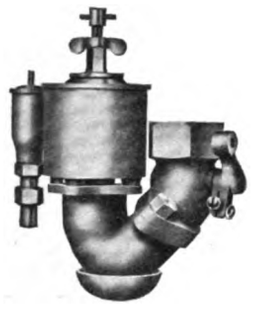
Information for Buyers

PALMBLA SYPHON CARBURETOR—The 1908 model Palmbla syphon carburetor, made by the North Chicago Machine Co., of North Chicago, Ill., is entirely new in its style and method of operation. The syphon principle is new in carburetor work and will appeal to mechanical engineers and carburetor experts. The carburetor has but one intake for air and, having no auxiliary intake, dispenses with moving parts. It has but one adjustment (gasoline), and gives a uniform mixture at speed ranging from 300 to 2,500 revolutions per minute. Mr. Palmbla, the inventor, has for three years past been experimenting on carburetors involving the principle embodied in this one, and he does not hesitate to say that its action is almost perfect. Its flexibility and efficiency are very remarkable. In a series of tests conducted with a 1" carburetor on a 5"x6" stationary hit and miss gasoline engine, a



stationary engine of the same bore and stroke of the throttling type, a 3¾"x4" double opposed motor, a 4½"x5" four cylinder four cycle vertical motor, a 5"x5½" single cylinder two cycle motor, a 3½"x4" double cylinder two cycle three port motor, all running at speeds ranging from 400 to 2,500 r. p. m., a constant blue flame at all times was emitted from the exhaust. The adjustment of the gasoline for all was practically the same. This proves that in the syphon method the gasoline feed was at all times fixed and in exact proportion to the speed of the air passing through the carburetor.

* * *

CURRENT RECTIFIER FOR ELECTRIC VEHICLES—The Studebaker Automobile Company, of South Bend, Ind., is now offering a device known as a mercury rectifier which, it is claimed, will greatly enlarge the field for the use of electrically propelled motor vehicles. The mercury rectifier transforms the alternating current, as commonly employed for lighting and power purposes, to a direct current from which the electric batteries in the car may be charged. Power may be secured in any town which has an electric lighting plant, and the rectifier may be set up in the garage, shed, or any other convenient place. Heretofore the electrically propelled vehicle has claimed, service being considered, the distinction of being the most economical form of local transportation. The introduction of the rectifier, however, reduces the already low cost of operation considerably more than one-half.

* * *

INDIANAPOLIS BUYS THREE MOTOR POLICE PATROL WAGONS: The police department of Indianapolis is to be equipped with three gasoline patrol wagons made by the Rapid Motor Vehicle Co., of Pontiac, Mich. During a test lasting two days, the demonstrating wagon made 51 runs, averaging for the round trip 29 blocks. The average time consumed on each trip was a little over 11 minutes. The time required to get under way after calls were received averaged eight seconds, which included starting the engine, loading prisoners, telephoning to headquarters, etc. A total of 185 miles were covered on just twelve gallons of gasoline, or 15½ miles to the gallon. This amounts to 1 4/37 cents per mile for fuel, a record that has probably never before been equaled in such service. The gasoline was measured by the officials, as they were particularly interested in the comparative cost between motor and horse. As the motor wagon did the work of three-horse patrol wagons, nine horses, three drivers and six patrolmen, the net saving is very great.

* * *

NEW IGNITION BATTERY: The Schug Electric Mfg. Co., of Detroit, is making a storage battery in which separate rubber jars overcome the danger of breakage. The bottom of the case is fastened with maple pins, these being in no way affected by the acid. There is no chance of corrosion with the Schug battery, because there is nothing to corrode. In every feature it is a strictly high-grade ignition battery. The separate jars, oak case, lead burned connections, extra heavy rubber handles or straps, maple pins, special sealing compound, and extra large thumb screws, cost more than the compartment jar usually furnished, and as a rule, without any wood case for protection; but as an offset, the Schug battery will have long life and cost little to keep in order. Three sizes are made—40, 60 and 80 amperes, all 6 volts.

* * *

KNOX FIRE TRUCK: The contract for a motor driven chemical hose and ladder truck has been awarded by the Chicopee, Mass., council to the Knox Automobile Company, of Springfield, Mass. The machine will be fitted with a 40 hp. air cooled engine. Including fire apparatus, the machine will weigh 7,500 pounds. The contract price is $5,000. Three fire department men will be instructed at the factory in the art of driving the machine.

* * *

TRUCK FOR ARMY WORK: The Couple Gear Freight Wheel Co., of Grand Rapids, has been awarded a contract to build a heavy truck for the war department. The machine, which will pull a trailer, will be of the gasoline-electric variety, with electric motors in all four wheels.

* * *

NEED MORE FACTORY ROOM.—The Auto Car Equipment Company, of Buffalo, N.

Police Wagon Demonstrated in Indianapolis.

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FOR ELECTRIC VEHICLES

THE "Exide" BATTERY

FOR IGNITION

Manufactured by THE ELECTRIC STORAGE BATTERY CO. PHILADELPHIA

NEW YORK BOSTON CHICAGO ST. LOUIS CLEVELAND ATLANTA SAN FRANCISCO TORONTO

SMITH AUTOMOBILE PARTS

Axles
Transmissions
Steering Columns

Brake Drums
and Steel Stampings
of Every Kind

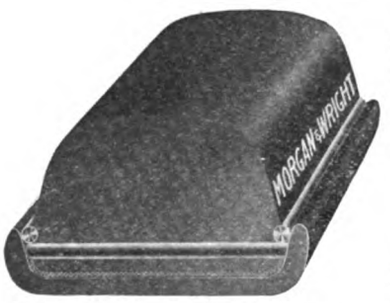
PRESSED STEEL FRAMES—HIGH CARBON—NICKEL—CHROME NICKEL

A. O. SMITH COMPANY

251 CLINTON STREET MILWAUKEE, WIS.

THE PIONEER MAKERS OF AUTOMOBILE PARTS

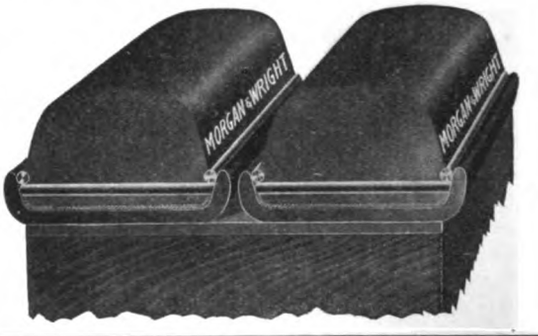
Morgan & Wright Side-Wire Motor Tires



Will reduce your motor tire expense. They are made from stock especially compounded for commercial motor vehicle service, and for any type of vehicle, from the light delivery wagon to the heaviest truck; or from victoria, coupe or brougham to the large sight-seeing car.

A Test of These Tires is Equal to a "Boost" for Commercial Motor Vehicles. Try them. Correspondence invited.

MORGAN & WRIGHT, Detroit, Mich.



Y., proposes to erect a large plant for the construction of motor trucks, public passenger vehicles and delivery wagons for general business purposes. The tract of land purchased for this purpose contains two and three-fourths acres and the cost of the plant as planned is about $52,000. The main building will be two stories high, 180 by 80 dimensions, and will be constructed entirely of brick, steel and glass. An 80 by 80 L will extend from the main structure.

* * *

CHICAGO AGENCY FOR RAPID MODELS.—The Ralph Temple Auto Co. recently secured the agency for the Rapid line in Chicago, contracting for the delivery of 35 machines during the season.

* * *

NEW FACTORY SUPERINTENDENT.—David J. Moveland, for several years field representative of the Rapid Motor Vehicle company, has been appointed superintendent of the company's plant at Pontiac.

* * *

NEW POLICY INAUGURATED.—The opening of a branch house in Boston by the Studebaker Automobile company marks the first step of a policy looking toward the opening of branch houses in all the larger cities. This policy is one that is founded on good business principles. It brings the buyer in close touch with the manufacturer and is an assurance that the purchaser's interests will be well taken care of.

* * *

POWER WAGON BUSINESS BOOMING.—"Whatever may be said about the effect of the recent financial flurry on the sales of motor vehicles in general," said an official of the Studebaker company recently, "there is one type that is receiving more attention than ever before, and that is the electric delivery wagon and truck. The reason for this seems to be that business men are coming to regard this type in its true light, namely that of a money earner for its owner. Up-to-date concerns all over the country, who have studied the subject of local transportation in all its various phases, are now substituting the electric power wagon for horse delivery; not because it gives more satisfactory service, but mainly because it is in the interest of business economy to do so."

CLASSIFIED ADVERTISING.

Advertisements under this heading are charged for at the rate of 30 cents a line of about seven words—payable in advance.

FOR SALE—Logan 2½ ton truck in perfect condition. Had very light use and like new all over. Just repainted. Cost $2,500. Price for immediate sale, $1,250. The best bargain ever offered. Indianapolis Motor Car Co., Indianapolis, Ind.

The Hubbard Patent Tire

Made of rubber blocks held in a Steel Rim with bolts that have a Steel Washer or Cap to cover the face of the rubber to protect it from wear.

Arthur H. Middleton

2821 N. Broad St., Philadelphia, Pa.

SUPPLEMENTARY SPIRAL SPRINGS

GRAHAM PATENT

Teaming Without Breakage

Save your tires, your engine, your patience and nerves. Booklet 15 free.

Supplementary Spiral Spring Company

780 Broadway New York (near 59th St

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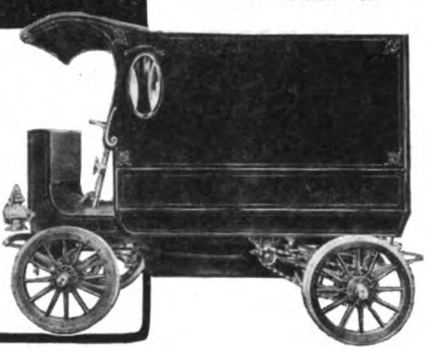
The Rapid Future

SIGHT-SEEING CARS 12 TO 25 PASSENGER.
ANY STYLE OF DELIVERY CAR.
SEVERAL MODELS OF TRUCKS.
ANYTHING DESIRED FOR SPECIAL SERVICE.



THE RAPID AGENT is making money. But what is more important, he is building a future in the automobile business that no other line permits of. How many cars would you sell next year if you could show every horse and wagon user that the purchase of your car meant to him a yearly saving of over a thousand dollars. Think it over and write me your facilities for selling the largest line of commercial cars in the world.

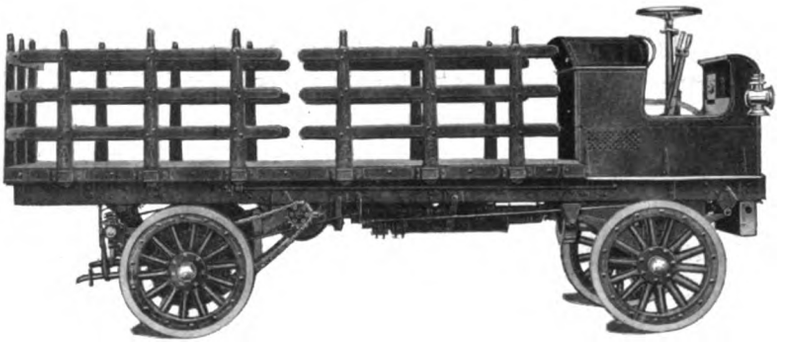
A. O. HENRY, Sales Manager

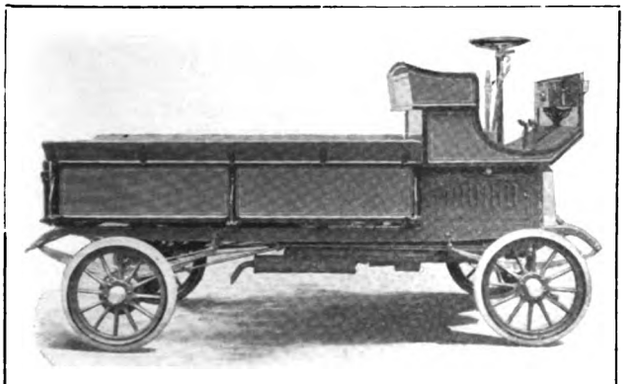
RAPID MOTOR VEHICLE CO. PONTIAC, MICHIGAN

$ $ $ SAVED

GIVE US YOUR NEEDS

American Motor Truck Co.
LOCKPORT, N. Y.
Western Office: Monadnock Block, Chicago

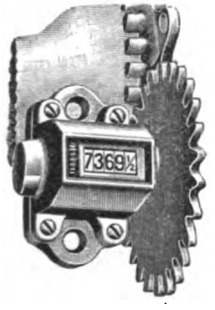




Get a Mitchell MOTOR TRUCK at the Mitchell Price

Deliver with the Mitchell Motor Truck.
Your deliveries will be made quicker.
You can do more delivering with it in a day than you can with two teams in two days.
The cost of keeping the truck is not more than the board and feed of ONE team.
People like to have their goods delivered by motor trucks.
It impresses the neighbors.
A motor truck lends dignity to your firm and an air of superior quality to your goods.
Get a Mitchell—1½ tons—20 h. p.—speed 14 to 15 miles—price $2000.
If you know Mitchell Pleasure Cars and their prices you know that this price is the very lowest obtainable for a high efficient, strong and reliable truck.
Write for literature and learn how to really reduce expenses by using **Mitchell** trucks,

Mitchell Motor Car Company
234 Mitchell Street **RACINE, WISCONSIN**
Member American Motor Car Manufacturers' Association.



KEEP TRACK OF

Mileage and Speed

¶ It is fully as important to register the distance traversed by a power wagon as it is to have a record of the fuel or electricity consumed, or the quantity of lubricant used. The mileage and speed of the vehicle is most accurately indicated by a VEEDER Instrument.

The Veeder Mfg. Co., Hartford, Conn.
Makers of Cyclometers, Odometers, Tachometers, Counters and Fine Castings

Westinghouse
Power Wagon Motors

Are designed and constructed to withstand all the power that can be applied to them in the propulsion of the vehicles for which they are built

Send for Circular 1059, it gives particulars.

Westinghouse Electric & Mfg. Co.
PITTSBURG, PA.

Sales Agent, American Distributing Co.
American Trust Building **CLEVELAND, OHIO**

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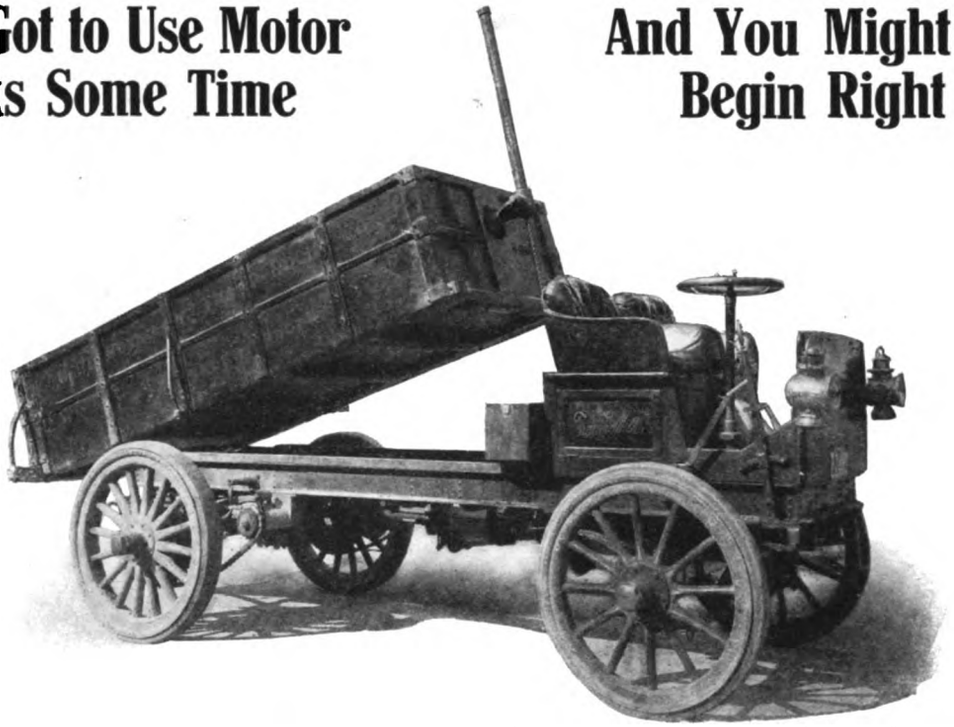
You've Got to Use Motor Trucks Some Time

And You Might as Well Begin Right Now



Regardless of the loads you have to transport, the Frayer-Miller Gasoline Truck will do your work economically and expeditiously. Regardless of the cold weather it will do it continuously. Its air-cooled four-cylinder engine works more satisfactorily in winter than a machine whose power plant is water-cooled. No freezing of the circulation. No interruptions to service—for which you have to pay. Regardless of what any prejudiced person may say, the motor truck—and particularly ours—will haul merchandise cheaper than horses if there is enough work for it to do. If there isn't enough work for the machine, stick to your draft animal transportation. Bodies to order.

Oscar Lear Automobile Co., Springfield, Ohio

ONE, TWO, AND THREE TONS

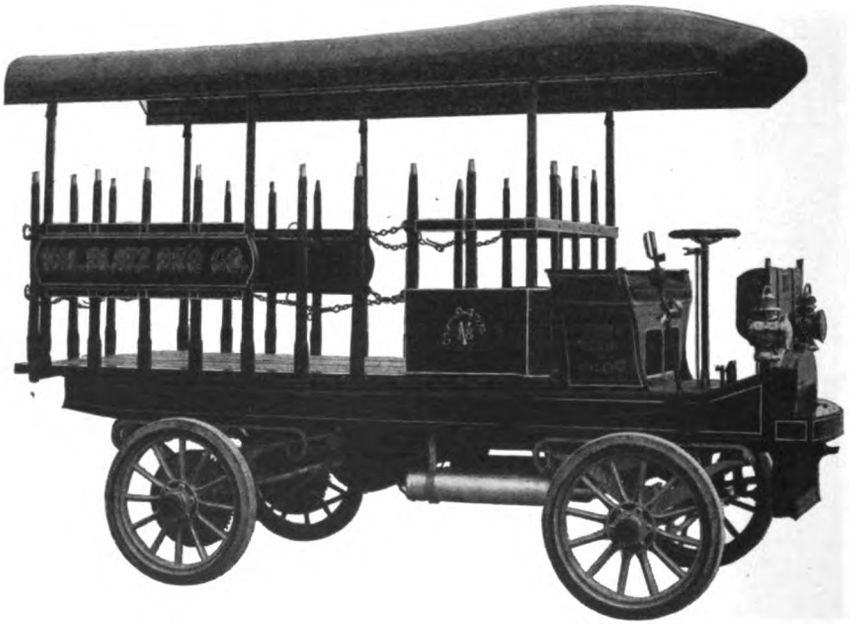
THIRTY HORSE POWER

FORWARD AND REVERSE SPEEDS FROM 1 TO 10 MILES PER HOUR

CAN NOT BE OVERSPEEDED

Agents Wanted in Unoccupied Territory

THE MEISELBACH TRUCKS



FRICTION DRIVE—PERFECTLY SUPPORTED ALL WHEELS ON TIMKEN ROLLERS
POWERFUL BRAKES—THE SIMPLEST AND EASIEST CONTROLLED TRUCKS YET SHOWN

THE A. D. MEISELBACH MOTOR WAGON CO., North Milwaukee, Wisconsin

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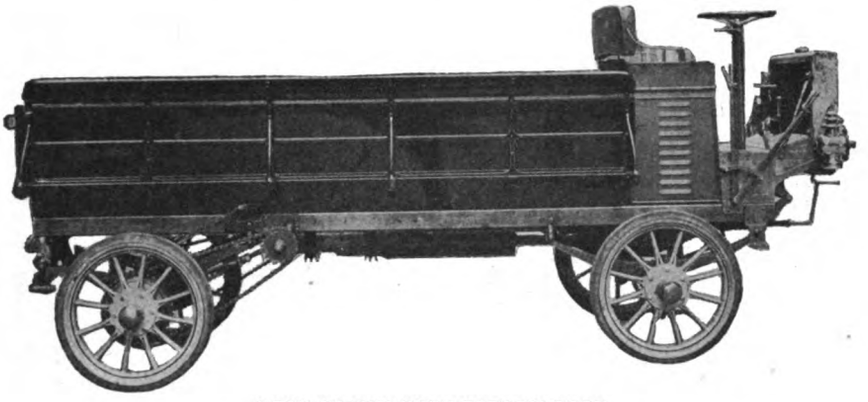
RELIANCE 1908 DETROIT



2-TON CHASSIS WITH EXPRESS BODY

DO YOU KNOW

We are To-day Building and Selling

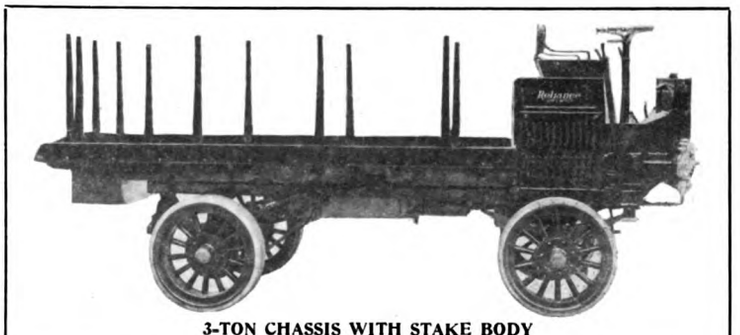
2-Cylinder, 2 to 2½ TON TRUCKS

3-Cylinder, 3 TON TRUCKS

4-Cylinder, 4 TON TRUCKS

EACH CAPABLE OF A 25 PER CENT OVERLOAD

THESE THREE SIZES



3-TON CHASSIS WITH STAKE BODY

Constitute the ONLY Capacities for Economical Trucking

Ask for Catalogue and Prices

RELIANCE MOTOR CAR CO.

Reliable Agents Wanted ::: **DETROIT, MICHIGAN**

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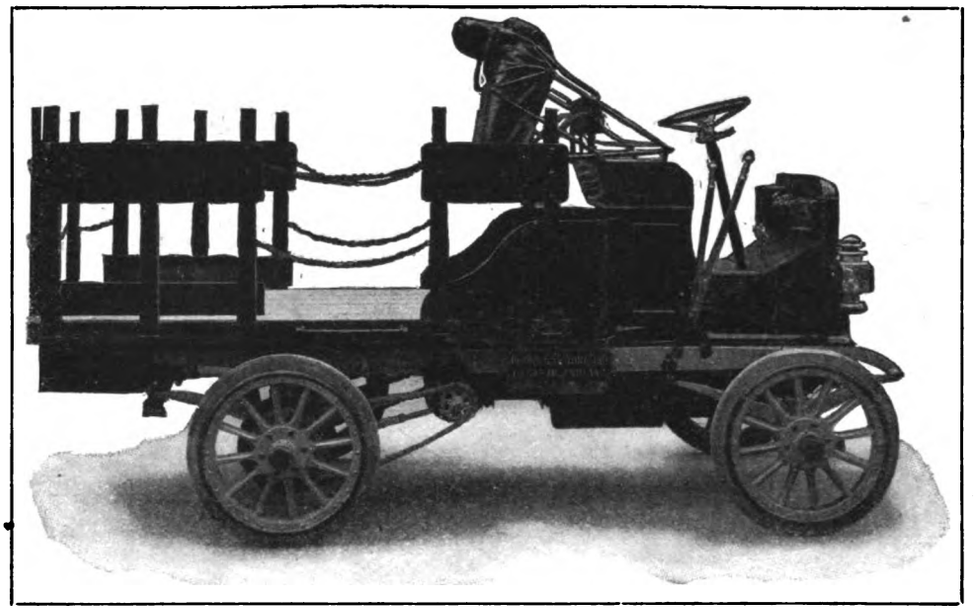
ECONOMY—COPPOCK

BUILT TO LAST **Years** NOT DAYS



ONE TRUCK DISPLACES THREE TEAMS

Cost of operation—less than 2 cents per mile.

It makes no difference what other commercial cars you have tried, without satisfaction—THIS is the ONE you have waited for, and will buy.

YOU WILL WANT PROOF.

All right. 30 to 60 days' trial in your own service, and you keep the tab. We solicit correspondence and will furnish full particulars and details.

COPPOCK MOTOR CAR CO.

FOURTH STREET, DECATUR, IND.

CARL HOLDREGE, Sales Manager :: :: :: 317 Railway Exchange, CHICAGO

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

No. 43 JUNE, 1908 No. 43

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WALTER WARDROP, Editor

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Interest in Motor Wagons Grows Keener

The Prevailing Commercial Dullness Compels Merchants to Study Comparative Transportation Methods

DURING the past six months every commercial house has been compelled to practice such strict economy in the administration of its affairs that executive attention has necessarily been sharply focused upon those departments which are not subject to delicate control. Wherever waste was detected it was promptly eliminated if such action could be taken without injury to the business.

In the course of these investigations the methods employed for the transportation of city merchandise did not escape critical examination. Although it is universally suspected that draft animal transportation is not economical the number of establishments which have had the courage and sagacity to test the soundness of this opinion is still relatively small. While commerce was flourishing and the future looked bright the majority have been disinclined to make systematic inquiry concerning the power wagon's superiority to the horse drawn vehicle. The policy of *laissez faire* always rules in such a time. But when calamity overtook the nation matters took a different turn. Now everybody wants to be enlightened concerning the machine's economy. This does not mean that everybody is eager to purchase power wagons. Far from it. It merely denotes that the languid interest which millions have taken in the subject of motor transportation has happily been exchanged for an intelligent conception of its economic importance.

* * *

Contemplation of the advantages of motor wagon transportation is the herald of its wide employment. One could wish that the period of contemplation should not be unduly prolonged, and yet reviewing the past, and remembering how many rash experiments have been precipitately undertaken, it is better that delay should mark the beginning of the industry than that it should be developed with such haste as to cause permanent regret. Reforms that are worth while and are to be enduring generally require a long time for their accomplishment. If the power wagon should suddenly overcome its competition, if by some unexpected turn of fortune it should break down all resistance to its employment, we might well suspect that its triumph and supersession would be nearly contemporaneous. There are problems of application, administration, traffic and engineering yet to be solved which will be all the more intelligently undertaken by being leisurely approached. Education is needed on every hand before it can become safe to assume that the machine is ready to be used indiscriminately. This process of education is proceeding apace. It began with the shadowy realization of the power wagon's physical usefulness. Large masses of people are now being trained to observe its comparative economy. In a little while its proper application will be widely understood, and when that period is reached its engineering will be so highly refined and the surrounding work conditions will be so favorable that its use will become a necessity instead of being governed by caprice, vanity or any of the other base motives which in many instances furnish it employment to-day.

* * *

Reflections of this sort may not be very consoling to those who have their capital invested in productive plants

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fifteen to forty per cent, depending on the individual peculiarities of your business.

The next time you are in the waiting room at Broad street station in Philadelphia look at the magnificent tableau representing the "Progress of Transportation." This was executed for the Pennsylvana Railway Company by Karl Bitter in 1895. The automobile does not appear there, while the air ship does, giving conclusive evidence that at that date automobiles were not generally thought of. Look around the streets today and answer if we have not made progress in the interval.

Go beneath the surface a little and you can satisfy yourselves that commercial automobiles have been continuously in service for ten years, and that five years ago their economical superiority over horses was generally recognized by most of the present users in eastern cities.

We have been keen enough to appreciate your necessities. We are also keen enough to know that your money has been earned with such difficulty that you are not going to risk it without considerable deliberation. This is the greatest assurance of our success, because it practically guarantees that the machines which you eventually adopt will be those particularly suited to your requirements, and that they will be used in such a manner as to produce the greatest benefit. This, then, is your real problem—what machines do you want, and how can you use them best? You can rely on your commercial instinct to select those machines which have proven their worth and are manufactured by responsible concerns with whom you can have honest dealings, not only now, but twenty years from this.

Knowing that there are such machines and such manufacturers, you can take up the matter as an ordinary bookkeeping proposition. The first step should be an analysis of your own organization so as to fortify yourself with accurate information on the details of your investment account, the details of your operating expense account, and the details of the way in which each section of your work, or wagon service, is performed. Having crystallized this information into a tabulated statement you will probably be confronted with some astonishing facts. You may find that you spend every year for the running of your stable or equipment (exclusive of drivers) a sum of money equal to the entire amount of your investment. You may find that your drivers alone cost you as much money per year as all your other expenses combined, and consequently you may spend twice as much money per year for running your whole plant as you have invested in it.

Naturally the importance of your expense for labor attracts your attention, and you begin to ask if there is any means by which this item can be reduced. This is the keynote of the situation. To find the answer you will have to find out whether any portion of your work can possibly be done more quickly with machines. If you can reduce the time to half you will reduce the labor to half. If another section of your business can be done by carrying double load per trip you can likely reduce your labor accordingly. It may so happen that in another division of your business the time consumed in loading and unloading, or the delay at freight yards, is the serious problem, and you may be surprised to find that a mechanical loading or unloading device operated by the power plant of the machine will render your men and machines more useful.

If you have carefully prepared the schedule showing the characteristics of your work all these peculiarities would become evident. It may appear that the running time of some of your trucks is only two to four hours, while during the remaining six or eight hours of the working day they are compelled to stand, due to the peculiarities of loading and unloading conditions, or perhaps congested traffic. Then, again, there may be house-to-house delivery, such as with milk or ice, where the inherent ability of the machine cannot be taken advantage of. But in these rare cases it can sometimes be shown that, by increased loads and with perhaps a proportionate increase of help, the work can be performed in such a manner by power wagons as to render a saving.

I am well aware that a contracting teamster's business is a most variegated one. It is principally made up of the hard nuts which the other fellow does not want to crack, embracing all kinds of business, and in many instances without any semblance of regularity. Nevertheless it is very evident that he succeeds, and the principal reason for his success is that he concentrates his brain on the problems at hand and works out an operating schedule which develops the best application of his working tools. Gentlemen, you have thus in your own business a vivid example of why so many users of automobiles have in the past made failures. They were incompetent to properly apply their machines, and, as vanity and incompetency usually go hand in hand, to shield their vanity they have discredited the machine. Unless you properly select and properly apply your machines you can no more hope for success than you could succeed in wearing shoes which do not fit you.

To aid you in this difficult problem you will find manufacturers ready to assist; and remember that they have far more at stake than you have, for they cannot ultimately succeed unless you succeed. Furthermore, they have already taken a far greater risk than you will ever be called upon to take. Years before they approach you with the finished article they have manifested sufficient confidence in the outcome to put up sufficient capital not only to manufacture but to provide for the long, tedious, expensive period of experiment and development. Don't you think these men are serious enough to do business with? Don't you think they are sufficiently interested in your particular case to sit down and counsel with you concerning the peculiarities of your case and to present their recommendations to you in such a manner that you can easily contrast them with the data you have already in hand regarding your present installation? There need be no technicalities provided the manufacturer you are dealing with is sufficiently responsible to merit your confidence. Consequently if the product is reliable all you are primarily interested in is a bookkeeping comparison, item for item, between your present system and the proposed system. This will bring out all the peculiarities as to where and how the saving will be effected, what changes may be called for as to re-routing and revision of schedules of operation. Having such an analysis of the situation you can proceed with the utmost caution. If your prudence dictates a gradual rather than a wholesale transformation you have before you a guide to make adequate allowance for the comparative economy of operation of a partial installation in contrast with the eventual complete installation. It is unnecessary to mention that as you approach the use of the maximum number of machines required the cost of operation will drop accordingly. I have had the advantage of analyzing a great many cases along the lines indicated, and during the past four months I have examined probably one million dollars' worth of horse installations. I have had the good fortune to represent manufacturers with wholesale policies, broad-minded enough to refrain from making installations where advantages would not accrue to the user, but I may state that with very few exceptions there has been a remarkable advantage presented.

THE ECONOMY OF MOTOR FIRE VEHICLES.

THE "flying squadron" is an interesting feature of the Springfield (Mass.) fire department service. Two motor hose and chemical wagons, each carrying a crew of eight men, put in an appearance at all fires, and as a result of their great speed frequently extinguish conflagrations before the alarm has quit ringing. Springfield has an area of 38 square miles and about 75,000 inhabitants. A year ago it was decided to strengthen the department by putting forty more men on the pay roll, but this idea was abandoned when it was demonstrated that a smaller number would be required if motor vehicles were employed. The wage economy alone, therefore, is as 16 to 40.

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Philadelphia's Electric Bus Garage.

Economy of Electric Bus Operation

Nine Months' Service in Philadelphia Shows that it is Fully 15 per cent Cheaper than Gasoline Bus Operation

AS EXPERIENCE accumulates it begins to be apparent that electric buses can be more cheaply and efficiently operated within the radius usually assigned to storage battery propulsion than gasoline or steam driven machines.

While, owing to the comparative novelty of electric bus service, considerable time must necessarily elapse before this opinion can be thoroughly confirmed, there is enough evidence at hand to excuse its presentation. Investigation develops the highly interesting fact that the electric bus service in Philadelphia is operated at 20.9 cents per vehicle mile, charges of every kind being reckoned in this calculation. If this record can be sustained, as seems likely when more machines are employed, the older established forms of mechanical bus service must yield pride of place to the electric vehicle in short haul transportation, for it can be shown that during eight months the work of 29 electrical units has been fully 15 per cent more economical than that of prime movers or steamers.

* * *

The best record for gasoline machines in a service of any magnitude is 23.874 cents per vehicle mile, all charges included. The operation of steam driven buses is even more expensive than this. Neither of these rivalling services is as reliable as the electric, which is a factor of great importance in the public estimation. Motors and batteries may be damaged, but the practice of quick substitution guarantees that the earning capacity of the vehicle itself shall always be at maximum. All repairs to electric buses are undertaken in the garage. Road troubles are seldom encountered, and consequently there is practically no interruption to traffic. If a machine leaves the station it unfailingly returns. This is of great importance to busy people who cannot afford to miss being carried to destination upon schedule time.

The conspicuous advantage of operating electric buses is precisely that which is made manifest in every other form of electric transportation; the stable charges do not increase in proportion as the number of operating units is augmented. The comparatively inexpensive staff which is required for a small installation need not be increased when more vehicles are added to the equipment. One battery caretaker, for example, can as conveniently look after fifty vehicle power plants as one. But he must be an expert. The stable care of gasoline buses is accomplished at much greater expense, a larger day and night staff being required. The charges for maintenance, depreciation and insurance are also very much higher. How much more costly gasoline machines are in these particulars it is not possible to say with definiteness at this moment, although we hope to furnish authentic information upon the subject within a very short time. This much we do know, that when the worst features of gasoline bus design are eliminated, as in the gasoline-electric vehicle, the operating charge per vehicle mile for depreciation and insurance decreases from 4.360 to 3.610 cents, while the day and night running charges drop from 2.030 to .676 cents. Depreciation in an electric bus which is thoroughly well cared for should not be very great. The batteries may be regarded as slow fuel and therefore practically indestructible. The motors will outlast the vehicle itself. The best examples of electric vehicle administration confirm the belief that the vital parts of such machines are as serviceable in their old age as when new.

* * *

An eminent British authority has expressed the opinion that the total cost of electric bus operation should not exceed 19 cents per vehicle mile. Two years ago it was the general belief that the cost could not be brought lower than 36 cents. As already stated the Philadelphia service costs 20.9 cents per vehicle mile, which sum will in all

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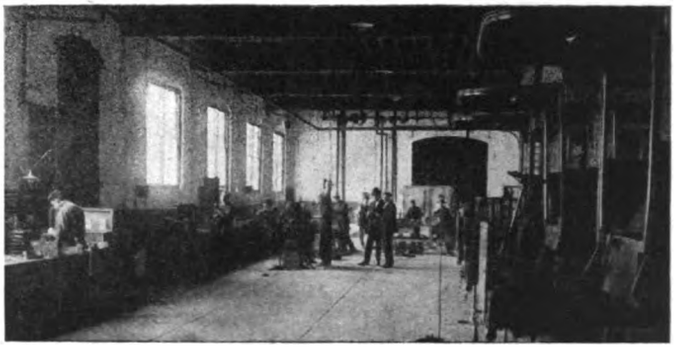
probability be considerably reduced by the time more machines are employed and the cost of operation is more finely distributed. In considering the British estimate of 19 cents it should be borne in mind that wages, current and all other things necessary to operation are very much cheaper abroad than here. Hence it is very probable that the Philadelphia service not only realizes the fondest ambition of foreign transportation experts, but actually transcends it. A counterpart of this service is to be found in London, where twelve electric buses are operating, having between July 15 and April 14 last covered 93,482 miles, carried 970,271 passengers and earned 26.12 cents per car mile at the low rate of fare there prevailing, which seldom exceeds two cents for any given route. Battery maintenance is undertaken by contract at 4 cents per vehicle mile in the London service.

* * *

The Philadelphia electric bus service is sui generis in this country. New York has a gasoline bus service. These two undertakings are very unlike, however, in other particulars than the source of motive power. In Philadelphia the fare is 5 cents. In New York it is 10 cents The New York enterprise is further advantaged in being legally protected against competition over its route along Fifth avenue. The character of and conditions surrounding the two undertakings being antipodal, it will be very instructive to watch the development of each, the one a monoply and the other a form of public service subject to competition and municipal restriction of every kind.

The history of the Philadelphia service can be briefly told. Its results are of great importance, as if they continue to be as satisfactory in the future as in the past the monopoly which gasoline buses have had in this class of transportation will be destroyed.

The Auto Transit Company of Philadelphia was organized in 1906 to operate passenger vehicles on certain

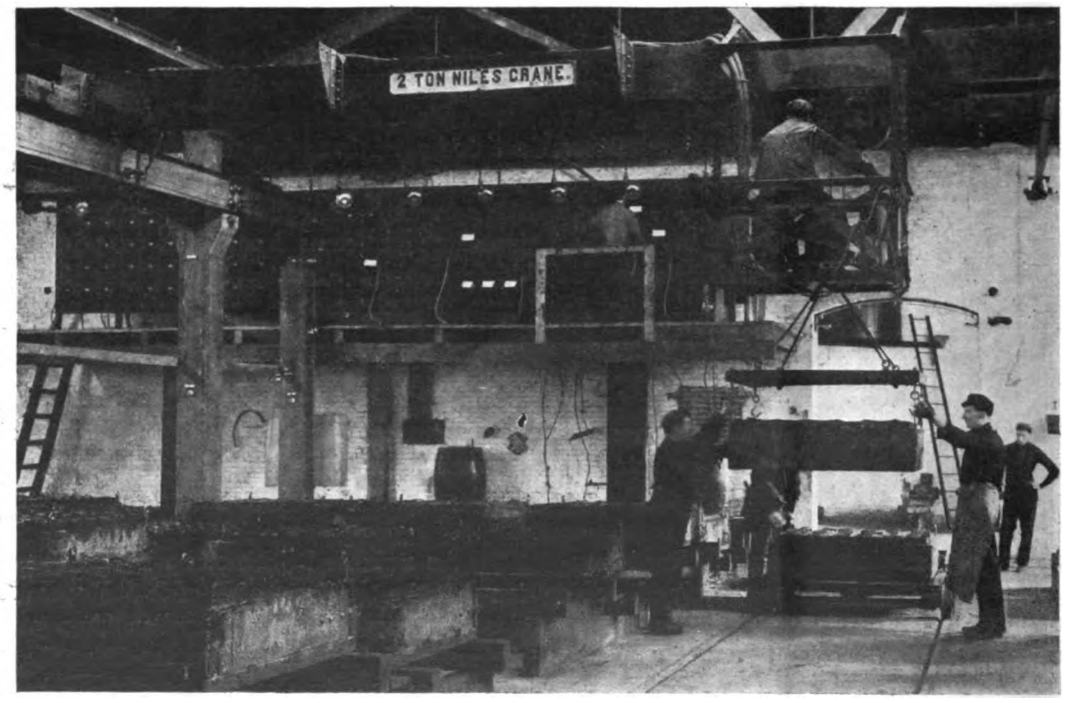


Repair Shop.

thoroughfares where the use of street cars and the laying of tracks was prohibited. The route selected for first demonstrating the practicability of the motor buses extended from Spruce street north on Broad street to Diamond street, thence west to 33d street and north to the Dauphin

Battery Room.

street entrance of Fairmount Park, a total distance of about five miles, or ten miles for the round trip. The coaches pass the City Hall, the Pennsylvania railroad sta-



Charging Room.

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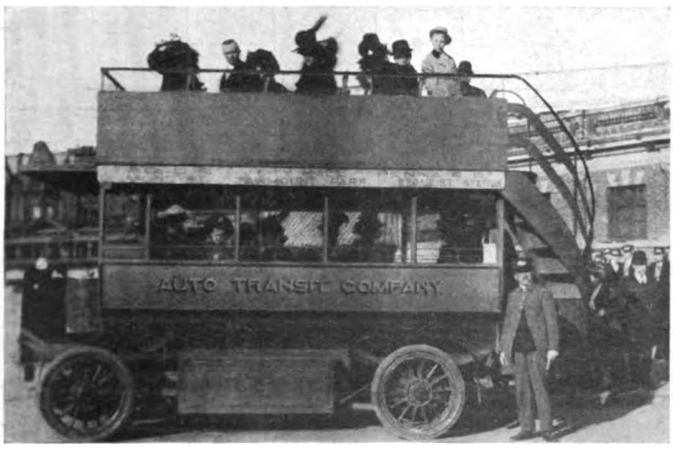
tion, the principal theaters, hotels and public buildings, and serve a densely populated portion of the city. As the same section is fairly well served by the street cars at a five cent fare, with six tickets for twenty-five cents, it was decided that the bus line, to be popular, should not charge more than this. The system of propulsion decided upon was the electric storage battery. The type of vehicle selected as being best adapted to this particular service was that known as the four motor four wheel drive, a separate motor being attached to and driving each of the four wheels.

* * *

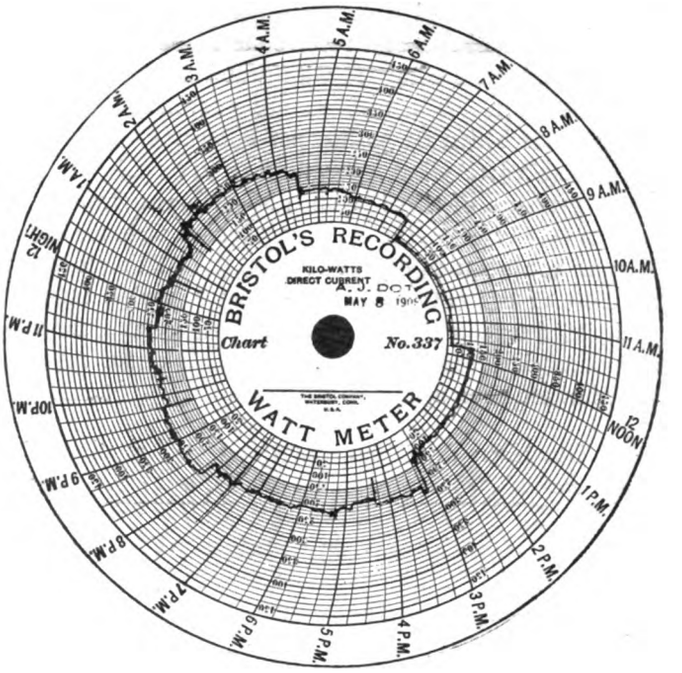
In February, 1907, one omnibus was built, following the general body design of a convertible street car, with cross seats for thirty passengers, removable side windows for summer service, entrance at the rear and exit at the front of the coach. After a few days trial on the streets this design was condemned as being unnecessarily heavy and unwieldly, besides being difficult of ingress and egress, owing to the height of the floor from the street. After considerable investigation it was decided to adopt the London type of double deck body, with seating capacity for sixteen passengers inside and eighteen on top. One vehicle of this type was built by the Commercial Truck Company of Philadelphia in March, 1907, which after thorough and exhaustive tests was pronounced satisfactory. Twenty-four additional coaches were ordered to be ready for service on July 15 following. There being no building suitable for a station to be had within reasonable distance of either terminus of the route, it became necessary to design and erect a building. The only site available was about one-quarter of a mile from the northerly terminal, and comprised two plots of ground separated by a narrow street, having a total area of about 35,000 square feet. Owing to legal complications this property could not be bought, but a lease for ten years was obtained and two substantial brick buildings were erected. The smaller of these buildings, 82 by 168 feet, contains the power plant and battery room. The larger building, 128 by 168 feet, comprises storage barn for fifty coaches, repair shop, store rooms, crews' quarters and offices.

* * *

The station power plant equipment comprises three 150 hp. De Laval steam turbines, each of which drives two



Type of Electric Bus Used in Philadelphia.



Electrical Recording Chart.

DELAY REPORT

AUTO TRANSIT COMPANY

Bus No..... Block No..... Run No.....

Date,..... Time,.....

Length of Time Delayed,.....

Cause of Delay,.....

.....

.....

.....

To Whom Reported,.....

How Reported,.....

Guard,..... No.....

Motorman,..... No.....

These reports must be made in all cases of delay, however slight, and forwarded to the Office immediately.

Daily Report Card.

AUTO TRANSIT CO. **TIRE RECORD** Wheel No.....

MAKE..... STYLE..... DATE..... 190...

ON	BUS	OFF	CAUSE	REPAIR	MILES

Tire Record.

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50 kw. shunt wound generators. The turbines condense on 26 inches vacuum and receive steam from two 175 hp. water tube boilers equipped with grates for burning No. 2 buckwheat coal. The turbines are guaranteed to show a steam consumption of 30 lbs. per kilowatt-hour output at the switchboard, when operating at full load under a steam pressure of 160 lbs. on a 26 inch vacuum. A test run on 80 per cent load with 25.5 inches vacuum showed a steam consumption of less than 28 lbs. This means that the cost of current for charging the batteries, including coal, oil, attendance and all fixed charges, and an ample allowance for repairs and depreciation, is about 1¼ cents per kilowatt hour at the switchboard.

* * *

The room devoted to charging and repairing batteries is equipped for handling 80 batteries and space is provided for 50 more. These are placed on timber stands. Lead covered cables are run to each stand. The system of charging is the three-voltage without rheostats. The generator voltage may be governed by field rheostats, and the current delivered at the switchboard is divided into 90,100 and 110 volts. When a discharged battery comes in it is connected first to the 90 volt line until the current decreases to a specified amperage, when the battery is switched to the 100 volt line. The battery is finally connected to the 110 volt line, where it remains until it is fully charged. The batteries consist of a single tray containing 42 cells of 21 plates each, connected permanently in series. The rated discharge of the battery is 70 amperes for 4 hours. In practice each battery makes three round trips over the route or thirty miles in all, when the coach is brought to the station for a fresh battery.

* * *

The method of handling the coaches as they come in is as follows: The coach is run into a driveway at one end of the battery room and stopped directly opposite a motor driven ram. In front of this ram is a battery truck, or car, on which there is a fully charged battery. On the opposite side of the coach and registering with the battery slides an empty car is placed. The battery in the coach is disconnected from circuit and an attendant starts the motor which operates the ram. In one operation the fully charged battery is pushed into the coach and the exhausted battery pushed out on the other side onto the truck placed there to receive it. The connections to the new battery are quickly made and in less than two minutes from the time of coming in the coach goes out for another thirty mile run. Three batteries are allotted to each vehicle, two being on charge to each one in service. This prevents any danger of overheating in charging and gives ample time for flushing and testing.

The coaches weigh 11,400 lbs. each without passengers. The tires are 4" dual all around. The route covered is asphalt paved throughout, with the exception of the City Hall square, which has been torn up considerably during the past year, owing to the construction of a subway, and most of the time has been well nigh impassible.

It is asserted by competent judges that more damage to tires has been caused by the condition of the City Hall square pavement than by all the remainder of the route.

Auto Transit Company

CREW'S REPORT

Bus ..... Date ..... 190__

Time ..... M.

MOTORMAN

Service Brake .....
Emergency Brake .....
Controller .....
Switch .....
Meter .....
Bell .....
Motors .....
Wheels .....
Remarks: .....

Signed ..... No. .....

GUARD

Windows .....
Seats .....
Floor .....
Register .....
Signal Bell .....
Lights .....
Steps .....
Rain Apron .....
Remarks: .....

Signed ..... No. .....

Crew's Report Card.

AUTO TRANSIT COMPANY
BATTERY RECORD

BATTERY NO. .....

SWITCH ..... DATE .....

TIME	TEMP.	VOLTS	GRAV.	AMP.

BUS NO. ..... DATE .....

TIME IN ..... M.

TIME OUT ..... M.

TRIPS ..... MILES .....

REMARKS: .....

Battery Record.

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The coaches run on an average about 120 miles per day, and 140 miles is not uncommon. There has not been a day during the past winter when the coaches could not be operated (if not on schedule at least very close to it), though there were two days in each of the months of January and February when service was suspended for the reason that the traffic offered did not warrant the operation of the line.

The batteries were cut apart and washed after five months service, and they are now being supplied with new positive plates at the rate of two batteries per day, which will require forty days to renew the entire equipment. The negative plates appear to be good for several months further service. The cost of tire maintenance has been high, so much so that service around the City Hall has been discontinued, pending renewal of the pavement.

* * *

Taken as a whole, the operators of the service are gratified at the success of their venture. Mistakes were made, as a matter of course, but not so serious as to cause discouragement. In addition to the original equipment of 25 double deck buses four open coaches have been purchased and fourteen others of the same type are now under construction. The company is satisfied that no other system of propulsion would have given such remarkable results in the way of mileage and reliability.

The system of records of operation and performance is very elaborate and complete. These records show that the cost of operation, including battery and tire maintenance, motormen, guards, electric current, repairs, interest, insurance and all fixed charges for 9½ months, ending April 30, 1908, was 20.9 cents per coach mile. With additional coaches this cost will be reduced, as most of the fixed charges are based on a 50 coach equipment.

LUXURIOUS MOTOR BUSES.

SIX motor buses of single deck pattern, fitted with revolving chairs, are being worked in London for the purpose of determining if sufficient patronage can be developed to indicate the employment of 200 such machines. A motor cab company is undertaking the experiment. The exterior finish is bird's-eye maple. Only nine passengers can be accommodated in each vehicle. A zone fare of 12 cents is being tried, which is about six times the usual motor bus fare. Pneumatic tires are fitted, although the weight of the machine is well over two tons. The machines, it is expected, will frequently be chartered for private use and will be popular with hotel guests.

The electric plow has made its appearance. Current is taken from the trolley wires through an insulated cable which, as the machine moves up and down the field, is wound upon or unwound from a large drum. The inventor says electric plowing should cost about 40 cents an acre.

In Prague, Austria, the postal officials collect letters by motor tricycle. Tests show that a collector on a machine completes work in 58 minutes, which formerly required 2½ hours.

Armature No. .....

OUT

Time ..... A.M. P.M. .....
Bus No. ..... Motor No. .....
Cause .....
.....
Out by .....

REPAIRS

.....
.....
.....
.....
.....
Turned Comtr.? ..... Comtr. Dia. .....
.....
By .....
Repairs Completed .....

IN

Time ..... A.M. P.M. .....
Bus No. ..... Motor No. .....
.....
.....
In by .....

Armature Record.

Wheel No. .....

OFF

Time ..... A.M. P.M. .....
Bus No. ..... Motor No. .....
Tires .....
INSIDE NO. ..... OUTSIDE NO. .....
Cause .....
.....
Off by .....

REPAIRS

Time ..... A.M. P.M. .....
.....
.....
.....
.....
.....
.....
By .....

ON

Time ..... A.M. P.M. .....
Bus No. ..... Motor No. .....
Tires .....
INSIDE NO. ..... OUTSIDE NO. .....
.....
.....
On by .....

Wheel Record.

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Reliability of Motor Fire Vehicles

Official Utterance Which Indicates That Horse-drawn Apparatus Will Soon Be Entirely Superseded

QUITE a while ago it was prophesied that when once our fire department chiefs became aware of the elemental advantages of motor driven apparatus their zeal for its adoption would be so lively as to force the immediate abandonment of the slower, less efficient and more costly horse drawn equipment. The prediction is on the point of being fulfilled.

As late as the beginning of the present year official opinion touching the value of motor fire vehicles was still in an unformed condition. Evidence was not lacking to show that the superior speed of the machines was appreciated at its true worth, but one heard or observed little which would indicate that their reliability and economy was being intelligently investigated. With the approach of spring, however, the greatest activity was exhibited among those who specialize the manufacture of such machines. An active campaign of education was commenced, which will not be abandoned until the fire chiefs of every city and town of any importance throughout the country are schooled in all the advantages to be gained from the employment of motor apparatus. The distribution of useful literature was followed by practical service demonstrations. Official interest in the machines was never permitted to grow cool. The brilliant records of native and foreign motor services were utilized to good advantage.

As the summer progressed and firemen began to gather in convention the work of the machines became the principal topic of discussion. At this moment the enthusiasm of the chiefs and their men for motor apparatus almost amounts to a frenzy, and their disappointment is likely to show itself in mutiny if liberal appropriations are not made for the betterment of the service. All seem to have simultaneously realized that the horse as an auxiliary in fire fighting has had his day.

* * *

In addressing the firemen who attended the Minnesota state convention one of the speakers clearly expressed the sentiment which prevails among his brethren, saying that it would be but a short time before even the volunteer corps of the country would be using motor driven apparatus. We reproduce this address for the purpose of showing how far advanced is the desire to discontinue the service of horses, a wish which will find responsive echo in every community which believes in adequately protecting life and property at minimum cost to those who require such a safeguard. The utterance is remarkable for the firmness of view it discloses with respect to the reliability of motor driven fire apparatus. It is Captain Barrett of Minneapolis who says:

I feel justified in stating that the fire department automobile is more reliable than the horse. It is common to see horses fagged and overcome from heat, while with the auto heat or cold does not change the efficiency of the apparatus, and it is therefore more reliable than the horse. Distance is not a consideration with the auto, but the horse must be considered.

I will cite the severe test to which the auto chemical engine and hose wagon has been put to in the Chicago fire department a year ago at a time when weather conditions were very unfavorable, which has demonstrated to the insurance companies, the fire department and the city officials of the country that the auto driven fire apparatus is no longer an experiment. I might also state that during the trial of three pieces of fire apparatus placed in service in Vancouver, B. C., there was not one time that they failed in making the steepest grades, or going through the muddiest kind of streets.

The insurance patrol of St. Louis, Mo., last month made thirty runs with the auto, at a cost of $3.69, whereas they maintained four horses to do the same work (only not as good) at a cost of $65. The auto patrol or chemical engine automobile, a combination chemical and hose auto, are the latest developments in fire fighting machinery. They are especially designed for hard fire duty. It embodies the weight-carrying frame of the commercial truck, with the high speed engine of the more powerful touring cars, designed to run over rough streets at the rate of 35 miles an hour.

The present day business man is too enlightened to invest in any fire apparatus which is not absolutely safe and reliable. The auto fire apparatus, which is recognized throughout several states of the Union, in South Africa and other foreign countries, is the coming fire apparatus of the world. There is no question of the automobile fire apparatus being entirely reliable under all conditions. The development of the gasoline engine has practically eliminated all opportunities for uncertainty. Its parts are very few; they are all simple and are so constructed as to give the utmost strength where strength is required, and the utmost lightness where the service will permit. Every engine of this kind must have a carburetor, a timer and a sparker, which of course involves a battery of some kind, and to know that all of these parts are in proper working order and adjustment requires a continuous careful attention of a competent operator.

By having an ample supply of parts in stock the machine can be kept in perfect working order at all times. An extra carburetor, a battery and other extras of that kind should be kept on hand and then with careful inspection there can be no failures. Even with a little carelessness, it is doubtful if an auto will fall down as many times in a year as will a horse. When you take into consideration the distance to be traveled and the speed available, the machine can cover three or four times the territory that can be covered by a team, and it can go back as quick as it went out. Barring accidents, there is no excuse except carelessness for the machine not to operate successfully whenever called upon.

I will cite the reliability and economy contest, which occurred on May 28, from Minneapolis to St. Cloud and on May 29 from Minneapolis to Northfield. It was a test under the most adverse conditions, especially to Northfield, which was 54 miles distant. At the outside not 10 miles of the distance would be considered fit for ordinary travel. It was water and mud up to the running board nearly all the way, with large ruts and ditches along the entire road, in a driving rain storm the greater part of the way. Seventeen autos entered and returned to Minneapolis without injury and in fine running condition.

It is seldom that a piece of horse-drawn fire apparatus sees 500 miles of service in a year. With such duty it is not difficult to maintain an automobile.

I believe that the day will soon arrive when automobile apparatus will be used in not only the large cities, having paid fire departments, but also in smaller volunteer departments.

A New York motor cab driver was killed one day last month when his machine, taking a curve at high speed, skidded and crashed into a tree alongside the driveway in Central park. Six passengers escaped unhurt.

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Mileage Capacity of Electric Vehicles

Tests Which Denote High Mileage Are Not Indicative of Constant Performance With Stock Equipment

AMONG the unenlightened much misinformation is current concerning the mileage capacity which an electric vehicle ought to possess. Many credulous people believe that such machines should be capable of traveling 100 miles on a single battery charge. This opinion is fostered by the questionable practice of equipping a light electric with tires that would be utterly unserviceable in regular duty and operating it under conditions which are made to order for long distance travel. Such performances are merely intended to deceive the unwary. They can not be duplicated in regular service with stock equipment.

* * *

Although prospective owners of electric pleasure cars are usually the victims of such misrepresentation the mischief it creates occasionally extends to the commercial classes who do not always realize the limitations of their transportation services and so are led to attach undue importance to vehicle mileage capacity. It is often asserted, and with good show of reason, that 80 per cent of city merchandize haulage is easily within the capacity of an electric vehicle whose daily range of travel does not exceed 30 miles. It is common, however, to find electric wagons of one ton rating covering 40 and even 45 miles a day in cities where the topographical conditions are favorable to such extended service. Daily delivery service which exceeds 30 miles is comparatively infrequent. Hence "century" trips by electric machines only possess interest for those who are fond of whatever is spectacular.

As it is important that no misrepresentation should exist concerning the duty which is to be expected from an electric vehicle, whether intended for business or pleasure, it will be profitable to analyze the conditions under which high mileage may be obtained from such a machine. The subject has been admirably handled by Hayden Eames, general manager of the Studebaker Company, who says:

Long distance electric automobile runs are still being made under circumstances which do not resemble in the remotest degree the conditions that prevail in practice. The majority of advertised runs of 100 miles or over are not performances indicative of what may be expected from stock electric vehicles, and the mileages thus obtained are as misleading as they are unattained in practice.

The necessity for mileage in excess of that offering a good factor of safety on the day's work is desirable or not only according to the manner in which the owner pays for his current. Of course if the owner pays for his current at so much per charge, irrespective of the degree of exhaustion of his battery, the more the capacity of the vehicle the less it will cost him. If he contracts for the charging and care of his vehicle by the month, and in consequence it is charged daily, which is the usual garage method, the excess mileage becomes of no avail, but rather an objection, inasmuch as, being seldom used, the capacity of a battery soon becomes limited to that required for the habitual mileage and the excess is reduced to that of simply *dead weight*.

The same effect usually obtains when the vehicle is charged through the customer's own rectifier. The cases that require mileage beyond a day's work are not frequent enough to compensate for the effort of the owner's usual practice of charging daily, irrespective of the degree of discharge to the battery, thus producing the same effect as referred to in the monthly garage method.

In this connection, therefore, we believe the following comparison obtained from an electric vehicle under the usual so-called test conditions, and the performance of the same vehicle under ordinary conditions of service, will be highly interesting. It will be noted that even under the regular service conditions the mileage considerably exceeds that usually required from day to day, and that obtained under special conditions, in addition to being misleading and impracticable, would sooner or later be a positive disadvantage.

Last summer two tests were made by the Studebaker Company of one of their regular victoria phaeton stock models. The vehicle used in these tests was one that had been in daily use for six months. In the first test the wheels were fitted with single tube tires, which ordinarily would be much too light for regular service, and the car carried only one passenger, the driver. The course was laid out over ordinary asphalt and brick paved city streets. The test was made with the top down, the driver starting the car after the battery had been charged and driving it until the battery was exhausted. The car was fitted with the usual battery equipment, a 28-cell, 9 MV battery. Progressive tests were made for total mileage with all four speeds. On the first, or lowest speed, the car covered a distance of 154.05 miles on one charge of the battery, at an average speed of 7.3 miles per hour. On the second speed, the car covered a distance of 135.5 miles on one charge of the battery, at an average speed of 9 miles per hour. On the third speed, the car covered a distance of 101.4 miles on one charge of the battery, at an average speed of 12.6 miles per hour. On the fourth, or highest speed, the car covered a total distance of 81.9 miles on one charge of the battery, at an average speed of 16.4 miles per hour.

After completing this test the same car was fitted with regular 3 x 33-inch standard clincher tires, loaded with two passengers and operated over the same streets under conditions which would in every respect approximate the work which the car would naturally be called upon to perform in regular daily service. This test was conducted in the same manner as the previous one, the first run being made on the lowest speed and then on the three higher speeds successively. In the latter test, however, the car was not run after the battery had begun to show signs of exhaustion. Under the conditions as given above, on the first or lowest speed, the car covered a total distance of 89 miles on one charge of the battery, at an average speed of 6.8 miles per hour. On the second speed the car covered a total distance of 76.5 miles on one charge of battery, at an average speed of 8.35 miles per hour. On the third speed the car covered a total distance of 66 miles on one charge of the battery, at an average speed of 11.7 miles an hour. On the fourth, or highest speed, the car covered a total distance of 53.5 miles on one charge of the battery, at 15.2 miles per hour.

It can easily be seen that the showing made in the first test is somewhat misleading, as it was made under conditions which would not ordinarily prevail in the every day use of a car. The showing, however, made in the second test is an excellent indication of the service which might be expected from a car in regular use in the hands of a private owner on ordinary city pavements.

The Reliance Motor Bus Company has been organized in Greenfield, Mass., with $10,000 capital.

The sum of $5,000 has been appropriated by the Underwriters Protective Association of Newark, N. J., for the purchase of a motor salvage corps wagon.

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Significant Co-Operative Movement

Many Important Manufacturing Interests Are Aiding the Cause of Electric Road Transport

WE HAVE now reached that period when all the important manufacturing interests involved by the use of electric wagons are earnestly and intelligently supporting one another. This is a fortunate circumstance for the owners of such machines, as it provides them with gratuitious and expert advice at critical times and tends strongly to standardize operating practices.

The hazard of maintenance, always considerable when unfamiliarity with the care of batteries and motors prevails, is rendered negligible when the problems presented are the special concern of establishments possessing high reputation in the domain of electrical science. In this respect the owners of electric wagons enjoy a distinct advantage over those who make use of other forms of commercial motor vehicles, the administration of which has not yet progressed to a point where the efforts to keep them usefully active are thoughtfully anticipated by their makers.

It is a sign of the forward state of electric wagon transportation that even the companies which supply current are found co-operating with the makers of batteries and motors in order to keep the vehicles profitably employed. The electrical interests make a virtue of necessity and stand by one another in every emergency. They are all members of one big family, and the obligation to sustain the credit and reputation of the various branches thereof is heavily felt. Hence it might be said that electric wagon transportation is almost a cult, the units of which have co-ordinating aims. Its advantages are well understood by its promoters, who think alike and act in harmony. Purpose marks the whole movement.

* * *

The potency of this federation becomes apparent when one reflects upon the magnitude of the allied electrical interests and the unanimity of opinion which prevails among them with respect to the economy of electric wagon transport. The lighting and power stations are the most numerous, as they are the most active supporters of the movement, and it is very interesting to observe how carefully they are drilled in all matters which pertain to the subject in hand. The electrical interests are noted for the thoroughness of their campaigning. No other industry makes such effective use of printer's ink. The methods taken to show why the 15,000 lighting and power stations scattered throughout the country should "root" for electric vehicles of all kinds are particularly instructive. Initiative is furnished where it is lacking, and this in turn is fortified by accounting which compares the cost of horse and electrical haulage. Details of the plan are found in the bulletin issued by the Electric Storage Battery Company of Philadelphia to the lighting and power stations, parts of which, culled from an address delivered before the Vermont Electrical Association, are herewith presented:

It is the duty of those interested in the general development of the electrical field to assist in bringing the electric automobile to the attention of the public. It has long since passed the experimental stage. Its use is fast developing a great field for the sale of electric current. Its value and merits are enhanced by the ease with which it can be operated, its simplicity of mechanism, and the ability to determine the continuity of operation. It is now recognzed that the electric has its own field, and that there is no real rivalry between it and the gasoline car. As a matter of fact, there are numberless cases where individuals have both types to meet different conditions of service. It has been demonstrated that it operates more weeks in the year than any other type. It is commonly spoken of as an all-the-year-round vehicle.

It is extremely interesting, especially to those furnishing electric current, to know that the electric vehicle under average conditions of service will consume more current in a month than a fan in two or three years, or a flat-iron in four or five years, and it is safe to say exceeds the current consumption of the average electric sign. It is therefore obvious that the electric vehicle offers central stations great possibilities for increasing revenue. This business is made additionally attractive by the fact that the current for charging can usually be supplied at times when the central station is running light, thereby increasing the load factor.

In a majority of cases, you will find two classes of customers: one for which it is more convenient to charge in the early part of the day, the other during the late night and early morning hours. Special rates may be made for current charging when taken during hours of light load, and cases exist where approximately 90 per cent of the electric vehicle load is taken during these hours. As a rule, the moral obligation of a customer has been found sufficient to secure the central station against the use of current for charging during restricted hours.

To furnish an idea of the extent of the work being done by central stations in other sections of the country in increasing and nursing the sale of current for electrics, I would cite St. Louis. Up to a year ago but few electric vehicles were in use in that city. The attention of the Union Electric Light and Power Company was drawn to the possibilities for business offered by the results accomplished by a good, live agent of an electric vehicle company, and a vigorous campaign was commenced, both parties combining forces in the work of advancing the use and sale of electrics. The Union company displays at night illuminated electric signs, advertising the electric automobile. The garage which this company has opened in the residential section of the city, for electric automobiles only, is one of the best equipped in the west. In this garage there are 40 electric vehicles and the company looks after about 20 more in private garages. It furnishes current for 60 or more additional vehicles in public garages and also for many electric trucks throughout the city. Its charges, I understand, are $35 per month. This includes washing, oiling and greasing the car, the care of the motor, commutators, inspection and all current required, one delivery and call per vehicle per day. For larger vehicles the charge is in proportion to the size of the battery and the space occupied by the vehicle. This does not include cleaning the battery, overhauling the motors, or repairs of any character. An extension of the electric vehicle business is now under consideration. As a result, all the leading electric automobile manufacturers are represented in St. Louis, and the sale of electric automobiles is increasing. Reports of a similar nature come from other localities in which the central station companies have openly shown their interest in encouraging the sale and use of electric vehicles. The total number of electric commercial vehicles in operation in St. Louis must be between 75 and 100. The total yearly current consumption of the commercial vehicle varies from six to ten times that of the pleasure vehicle, according to capacity, as will be seen by the figures which I present later on.

The Edison Company, Rockford, Illinois, has successfully

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pushed this feature of their business for the last two or three years. In that city very few electric vehicles are kept in public garages, the private garage in close proximity to the owner's residence proving more popular. The last report showed that 75 electric vehicles were cared for in this way by the owners, current being supplied by the central station company.

A few of the other light and power companies that have been and are instrumental in promoting the use of electric vehicles in their territory are the following: The Seattle Electric Company, Seattle, Washington; The Freeport Street Railway and Power Company, Freeport, Illinois; Birmingham Railway, Light and Power Company, Birmingham, Alabama; Little Rock Street Railway, Light and Power Company, Little Rock, Arkansas; Springfield Light and Power Company, Springfield, Missouri; McNeen Light and Power Company, Galesburg, Illinois; Michigan City Light and Power Company, Michigan City, Indiana; South Shore Gas and Electric Company, Hammond, Indiana; Narragansett Electric Light Company, Providence, Rhode Island; Lowell Electric Light Company, Lowell, Massachusetts; Salem Electric Light Company, Salem, Massachusetts; Manchester Electric Light Company, Manchester, New Hampshire; Worcester Electric Light Company, Worcester, Massachusetts; Newport and Fall River Street Railway Company, Newport, Rhode Island; Edison Electric Illuminating Company, Brockton, Massachusetts; Hartford Electric Light Company, Hartford, Connecticut; Edison Electric Illuminating Company, Boston, Massachusetts; The Chicago Edison Company; The New York Edison Company; etc.

In fact, I might include all Edison companies throughout the country. A majority of these companies set an example by using, wherever possible in the conduct of their business, electric automobiles instead of any other type. The New York Edison Company operates 57 electric vehicles; the Chicago Edison Company 12; the Philadelphia Electric Company operates about 35. Within a radius of 40 miles of Boston there are 50 electric vehicle charging stations.

The following figures give an approximate idea of the current consumption of three different types of vehicles, the income of the central station company under the assumed rates per kilowatt hour, and the average daily mileage per car ordinarily made. The domestic, professional or light business vehicle will require, for one charge, from 12 to 15 kilowatt hours, according to the capacity of the battery. Figuring on the basis of 12 kilowatt hours at 6 cents, it will cost 72 cents per charge. On the basis of an average run of 15 miles per day for 300 days per year, we have a total of 4,500 miles per annum. If the vehicle does 50 miles per charge, it would cost 1.44 cents per mile for current, or $64.80 per annum.

A light truck having a rated carrying capacity of about one ton will require, for one charge, about 20 kilowatt hours. On a 4 cent per kilowatt basis, the cost per charge would be 80 cents. Figuring on a 30-mile radius per charge for 300 working days of the year equals 9,000 vehicle miles per annum, which, at 2⅔ cents per vehicle mile, equals $240 per annum.

A truck with a rated carrying capacity of five tons will require about 34 kilowatt hours, which, on the basis of 4 cents per kilowatt hour, equals $1.36 per charge. On the basis of a 25-mile radius for 300 working days, 7,500 miles per annum, at 5.44 cents per vehicle mile, the cost of current equals $408.

On the above basis of figuring, a load on your station equivalent to 10 each of the above types of vehicles would mean an increase in your gross receipts of $6,873 per annum. Consider for a moment what this means, when the electrics are counted by the hundred, as is now the case in many of our larger cities, some of which are nearing the thousand mark, while others have already passed it. It is interesting to note here, that to take care of this valuable load during the hours when your generating apparatus is running light, you need not lay out a dollar for additional machinery. The opportunity offered is too good to be ignored, and the conviction comes forcibly home to us that it is simply a case of putting our shoulders to the wheel to reap the reward awaiting us.

In an article in *The Electric Journal*, May, 1906, the author cites a case of an express company which clearly demonstrated the superiority of the electric over horse wagons. This is a situation wherein one electric wagon during two weeks before Christmas easily did the work of five single-horse wagons under adverse conditions of winter weather. He says: "It must not be assumed from this that this is a performance that invariably can be expected, but what was accomplished in this case could be again achieved by others; though it would be hardly correct to say that this is likely, because men are rare who are able to get the best out of any piece of apparatus." The author quotes from the original statement of the express company's agent, showing the comparative conditions indicated by his memoranda at the end of the first year. The table showed on one side for the horse equipment investment in 3 wagons and 4 horses, interest, depreciation, repairs, feed, shoeing, care and stable expenses, harness, blankets, saleries of three men, etc. On the electric vehicle side were shown the investment in one electric vehicle, the annual expenses covering the electric current, interest, depreciation, mechanical repairs and salaries of two men. The annual saving of the electric over the horse wagons was $1,500.

The following tabulated comparison of costs is even more interesting. The figures given under "Horse" are taken from a Massachusetts company's records covering a number of years of service. This concern, after operating a 3½-ton truck for twelve months, has recently ordered a second equipment, and figures that these two electric vehicles in their service can do the work of six two-horse wagons. The figures under "Electric" are compiled from reliable data covering a wide experience combined with good commercial practice. It is, however, only reasonable to suppose that conditions of operation may cause these figures to vary, but the margin of difference in the cost of operation in the two systems is so great that even the most skeptical prospective purchaser will find little room in his mind for doubt.

HORSE.

Investment:		
12 horses at $400	$4,800.00	
6 wagons at $300	1,800.00	
6 double harnesses	600.00	
Blankets	50.00	
Interest at 5% on	$7,250.00	$362.50
Perpetual Maintenance:		
Dep. horses at 20%	$960.00	
Dep. wagons, etc., at 10%	245.00	
Repairs, shoeing, veterinary, etc	999.36	
		$2,204.36
Rent of Stable		180.00
Labor, hostlers' wages		1,036.95
12 men on teams		7,488.00
Feed, Bedding, etc		2,363.44
		$13,635.25

ELECTRIC.

Investment:		
2 3½-ton trucks, 1 extra battery	$8,250.00	
Interest at 5% on	$8,250.00	$412.50
Perpetual Maintenance:		
Trucks (minus batteries and tires) allowing dep. 20%	$1,000.00	
Batteries: renewal, repairs and cleaning, $1,200 to	1,400.00	
Tires, $1,200 to	1,800.00	
		$4,200.00
Rent, garage		180.00
Labor, 4 men and wagons, $18 and $12		3,120.00
Emergencies		500.00
Elec. Current, 600 charges, 32 kw. at 4 cts		768.00
		$9,180.50
Annual Saving over Horses		4,454.75

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The saving in cost of operation, over horses, in this case is about 32½ per cent. From the above figures it may be seen that the trucks would pay for themselves in about three years, and also that the proceeds from the sale of a stable, operating under similar conditions, could be most profitably invested.

Another New England manufacturing company finds that by the use of three electric trucks they are effecting a saving of 50 per cent over the use of horses. Additional evidence of the popularity of the electric is given by the fact that New York and Chicago, some time ago, passed the thousand mark in number of electrics in operation, New York having about 2,400. Cleveland has about 800 electric vehicles in use. One express company operates a total of about 250 electric delivery wagons; one brewing company has about 60. The New York Transportation Co. has over 500 electric cabs in constant use.

The reports we hear from a number of users of commercial vehicles are of a most flattering character. Some of these concerns, which have had an experience in the operation of the electric extending over a period of five or six years, have kept a detailed account of expense of operation, and report a marked saving in the use of the electrics over the horse-drawn vehicles, appreciating, also, their cleanliness, noiselessness and the readiness with which a new driver may become familiar with their operation. The electric covers hilly sections with ease, and the stalling of a vehicle on the road because of breakdowns is a rare occurrence.

Many users consider the electric truck as equal to two two-horse trucks in the class of service in which they are generally used. It is a significant fact that those who have been operating electric trucks for a period upward of six years are constantly adding to their equipment.

In my investigations of the conditions existing in the electric vehicle field, the results of which would impress anyone interested in the subject, I have received reports from some of the principal cities, operating an aggregate of 12,000 electrics. I have yet many more cities from which to hear, but the information received to date is sufficient for us to determine the prevailing sentiment regarding the electric vehicle, which throughout is of a most favorable character, the only adverse reports coming from sections operating a total of not over 200 vehicles.

Among the hundreds of replies received to my inquiries, there were two only that referred to bad roads and very steep hills. In regard to these, it is obvious that there are limitations to the abilities of the electric vehicle, as in all things; but the conditions we find in our cities to-day are met by the expenditure of energy, which the car is capable of delivering; and though under unusually severe conditions the expenditure of a greater amount of energy means a somewhat shorter mileage radius, that is all it does mean in the properly designed and well-cared-for equipment. The care a vehicle gets is a more important matter than the question of hills. If the owner takes care of his vehicle, it in turn will take care of the hills. An electric trolley car, for economical reasons, is inspected every day. The electric vehicle does not, as a rule, get one-twentieth part of this care. The success with which the trolley car has met is largely due to the efforts of well-organized, experienced forces. The success of the electric vehicle is more remarkable, considering the fact that in a majority of cases it has been thrown into the hands of those who know absolutely nothing about it.

Miles and miles of improved streets are going into all the cities and towns; this naturally enlarges the opportunity for extending the use of automobiles, especially the electric. The electric has found a ready sale and is being operated successfully in hilly cities, such as Pittsburg, Providence, Kansas City, Cincinnati, Troy, N. Y., etc. The fact should not be overlooked that hills which are severe for automobiles are still more severe for horses.

As regards economy in the application of the electric vehicle to commercial work, it is purely and simply an engineering proposition, depending largely upon the service to be rendered and the conditions to be met. By taking it up with your prospective customer in this light, it can be dealt with and handled in a most intelligent manner.

While the subject of this paper was intended to be confined to the sale of current for electric automobiles, it was suggested by several persons that, owing to the importance of the battery in the work of the electric vehicle, I touch on the battery subject to the extent of furnishing such information as might be useful in this connection.

A lead-lead storage cell has six essential parts: a set of positive plates, a set of negative plates, separators, suitable conductors, a bath of dilute sulphuric acid and an acid-proof containing jar for the whole. Roughly speaking, when a cell is in a state of charge, the active material of the positive plate is a high oxide or peroxide of lead. That on the negative plate is metallic lead in a highly porous or spongy state. When the cell has been discharged, both plates contain more or less sulphate of lead. In other words, the result of discharging a cell is to remove acid from the liquid, and combine it with the substance of the plates, producing the sulphate. The result of charging is to restore the acid to the liquid and the plates to their former condition. The cell has an electro-motive force of about two volts. The exact value of the pressure at the terminals of the cell depends on the state of its charge, and on the work that it is doing at the moment the observation is made. These two characteristics are of value in keeping the operator of a battery informed as to its condition. Since many electric automobiles are provided with a voltmeter and ammeter to indicate the pressure and current furnished by the battery, the voltage test is the easier of application, as it can be made without stopping, but the acid test reveals conditions that the voltage test does not show. To gain a full knowledge of the conditions of the battery, both tests should be understood and considered in relation to each other. The specific gravity (density) of the acid is measured by a hydrometer floating in it; the denser the acid, the higher it floats; the degrees of gravity are marked off on its stem. To apply this test, it is necessary to take a sample of acid from a cell with the syringe hydrometer.

Perhaps the best way to bring out the main points in this connection will be to follow the changes through a complete cycle. Starting with a charged battery, we find the positive plates a dark chocolate color and the negatives a gray lead color. The acid has a specific gravity of 1.275, and the voltmeter shows about 2.15 volts per cell, or about 52 volts for a 24-cell battery on open circuit. Since it requires pressure to force current through any conductor, the instant the battery begins to discharge, a portion of its open circuit pressure is absorbed in the battery itself. This loss is small, the amount depending of course on the value of the discharge current flowing. Thus a PV-9 Exide 24-cell battery, starting to discharge at its 4-hour rate (24 amperes) will drop from its open circuit reading (52 volts) to 50½; if the rate were doubled, it would drop to 49¼. Assuming the automobile to be running continuously on a level for a period of four hours, the battery discharging 24 amperes, the voltage will fall gradually during the greater part of the discharge, and then towards the end more rapidly, until 41 volts, or 1.70 volts per cell, is reached at the end of the four hours, at which point the battery is practically exhausted, so that if the discharge be continued further, the voltage will drop very rapidly to a low point. When the discharge is stopped, however, the voltage will rise almost instantly to 45 volts, and in 25 or 30 minutes to 49 or 50 volts. Further, after the above discharge, the gravity of the electrolyte will be found to have fallen to 1.175; a difference of 100 points on the hydrometer scale. As this change in gravity is proportional to the time, the rate of discharge being uniform, it follows that a gravity reading, taken at any intermediate point, will reveal how much of the available capacity remains. From the fact that the drop in voltage is not uniform throughout the discharge, as explained above, it is more difficult to estimate the available capacity remaining, although with practice this can be done with very satisfactory results.

The battery is now ready for the charge. The open cir-

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cuit reading is 49 or 50 volts, but as soon as the charging current of 19 amperes starts, the voltage jumps to 51 or 52 volts, because now the effort to force current through the battery is from the outside, and the difference is added to the pressure of the battery. The current passing through the battery evolves oxygen at the positive plate and hydrogen at the negative plate. These gases, acting on the sulphate left in the plates by the discharge, return them to their original condition. At first the action is quiet and without visible effect, but as the charge proceeds the pressure rises slowly; and towards the end, as the amount of sulphate becomes limited, some of the gas evolved, being liberated faster than it can be used, begins to come off through the liquid in bubbles. As the charge nears the end, the bubbling becomes violent, and the voltage rises quite abruptly to 2.55 per cell, or 61 volts. At this point the charging rate should be reduced to 8 amperes, because the unconverted material (the sulphate) in the plates is so small that the bulk of the current is being wasted in forming gas. The charge is now continued at this rate until the specific gravity of the electrolyte and the voltage of the cell fail to rise any further, at which point the charge is complete, and the voltage will be about 2.55 volts per cell, or 61 volts for a 24-cell battery. A maximum voltage and density must be obtained to insure a full charge. The final voltage may be higher or lower, depending upon variable conditions, such as temperature, etc. Temperature will affect the gravity of acid as that of any other substance. It will also affect the degree of chemical activity. The best results are obtained with the temperature between 70 degrees and 90 degrees F.

The age of the plates also will somewhat alter the voltage readings, as well as the capacity. As there may be sediment in an old battery, some of the acid is lost by having been combined with it; therefore, when the plates are charged and all the acid in them has been expelled, a gravity reading might not show full 1.275; but if the electrolyte fails to rise in gravity with continued charging, it is evident that all the acid is out of the plates. The gravity reading is also affected by evaporation of the water from the electrolyte. Naturally, if a portion of the water has evaporated, the gravity will appear greater than the state of charge calls for under normal conditions. The height of the liquid in the cell should always be kept above the tops of the plates by the addition of water when needed.

Overcharging or overdischarging a storage battery is as undesirable as overfeeding or overworking men or horses. The reasons are not difficult to fathom. We have seen that at the end of charge gas bubbles are freely liberated from the plates. These agitate the liquid and cause washing of the material; besides, the gas is liberated more or less beneath the surface of the active material, and cannot but push and crowd the particles as it works through, thus loosening them and tending to shed some from the surface. Moreover, an overcharge cannot add capacity, for when all the material is converted, further charging is a mere waste of energy, as well as a detriment to the plates. In other words, when a vehicle battery is in daily use for short runs, do not charge until over 50 per cent of the capacity has been exhausted. By following this course, not only is money saved on the current bill and the life of the plates increased, but the battery will give a greater mileage.

Overdischarge results in a loss of life, largely by increasing the necessity for overcharge. The further the sulphation is carried, the greater will be the work that has to be expended upon it to bring it back to an active state, and therefore, the longer the overcharge. Allowing a discharged battery to stand without charge permits the sulphate to work deeper into the plates. In that condition the process of sulphating goes on, even though no demands are made on the battery. The man who wishes to keep his battery in perfect condition will give it at least a partial charge at once if he has run his battery very low.

If the plates have been oversulphated, the operator may be deceived by the rise in voltage, which will appear to indicate a full charge very early, because of the higher resistance of the sulphate to the current and also a portion of the material may become fully charged, while the rest, being badly sulphated, is being converted very slowly. An acid gravity reading will, of course, reveal the fact that all the acid has not left the plates. The attention necessary to secure the best results is but slight, but it must be that which is based upon an intelligent grasp of the subject.

To follow instructions without knowing why is uninteresting work, and not productive of the best results. The company which I represent was prompt to recognize this fact and has spared itself no pains or expense in its educational and development work along these lines. It invites the co-operation of all interested parties, and upon request will gladly furnish complete instructions in the care and operation of its batteries. The company has carried on a vigorous campaign from the inception of the electric vehicle, and now has located throughout the country battery depots to the number of several hundred for the convenience of its customers. The effect of this work is felt by the manufacturers, the agents, the operators and the owners of electric vehicles, and by the power stations that furnish the current.

CABS FITTED WITH EDISON BATTERIES.

ONE hears so little about the Edison battery in this country these days that it is rather surprising to learn it is the subject of considerable European interest. In Germany and England, especially, efforts are being made to bring it to public notice. A company has been formed in the latter country to exploit electric vehicles fitted with the "wizard's" much discussed invention, cabs of the landaulet pattern being the object of first attention. The machines are to be commissioned for service in London. They are to be equipped with a battery composed of 62 cells, which will give a range of 55 miles on one charge. When the vehicles are coasting the motor, we are informed, is to be used to re-charge the battery. This practice the company styles "recuperation".

Notwithstanding its loss of $131,995 in 1907 the Berlin Omnibus Company proposes to extend its motor bus service. In 1906 the company made a profit of $149,990. It appears that the loss was caused by neglecting to make repairs until the machines were absolutely unfit for street work. When repairs were eventually made they amounted to 50 per cent of the cost of the vehicles. A policy so extravagant as this could have no other result than that stated in the opening sentence.

Following the example set by Bavaria the Bohemian government now gives state aid to those who operate motor postal buses in the rural district. The machines, of single deck type, carry 17 passengers.

Eighty-eight tons of beer, carried on a motor road train, was recently transported through the streets of Berlin. The train was composed of a steam tractor and six trailors.

Pending the extension of the Bagdad railway the Turkish government has sanctioned the use of automobiles in transporting mail between Eregli and Aleppo.

Motor bus service is now being supplied between Richmond and Steubenville, in Ohio.

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Motor Wagon Subsidies

Governmental Aid is Extended to German Firms Which Produce Successful Military Motor Vehicles

MILITARY interest in the work of motor wagons continues without the slightest symptom of abatement in Europe. Indeed it is constantly being made evident that in the motor road vehicle the war ministries of many continental powers have an auxiliary whose usefulness it will be decidedly advantageous to develop without regard to the imminence or remoteness of actual hostilities.

Fresh proof of the high esteem in which the German government holds the motor wagon is furnished by the announcement of the conditions under which heavy vehicles of this class are to be subsidized. It has been decided to grant $1,000 per vehicle to three makers of 30 hp. wagons, which sum is to be payable four weeks after delivery. An allowance of $250 annually is also made to cover the cost of operation. In return for this subvention the government requires that the aforesaid makers shall hold the vehicles ready for military service and in the event of war put them at the command of the army administration at a fixed compensation. The purpose of picking the product of three concerns is explained by the desire of the war authorities not to possess a miscellaneous collection of machines. Uniformity of equipment, it is argued, will tend to simplify the duties of maintenance. The useful life of the machines is assumed to be five years, which is the period covered by the subvention. The conditions to which the government has asked the manufacturers to subscribe are as follows:

1. Premiums for construction and working, as well for fuels: (a) Single premium for building vehicle, payable on definite acceptance of same, 4,000 marks; (b) working premium per vehicle, over a period of five years, payable at end of each year, 1,000 marks; (c) working premium for using home-produced fuels—amount to be determined by army administration. Supplementary note to (a) and (b): These words apply to vehicles of 30h.p. In the case of larger machines, which otherwise conform with conditions laid down, the sum payable may be increased. Every party desiring to work vehicles for which a subsidy is claimed from the army administration must make application, prior to manufacture, to the war office, which will then decide whether a subvention shall be granted.

2. The army administration reserves to itself the granting of additional premiums in the following cases:—(a) Successful creation of market for adoption; (b) production of types economically superior to horse-drawn vehicles; (c) organization of lines especially calculated to further the military objects pursued by the adoption.

3. For the adoption of vehicles fitted for military purposes the army administration proposes to negotiate with manufacturers or with operating companies.

4. Private persons desirous of working self-propelled vehicles conforming with military specifications are advised to address themselves to one of the manufacturers or operating companies, and in this way participate in the State subvention.

5. Automobiles must be built at home, and be certain types from such factories as the army administration knows from its own experience to be specially suitable. The army administration alone will decide whether a type of vehicle is, or is not, adapted for military purposes.

6. On new vehicles being taken over in the factory by the operating party or his agent they will be tested by an officer of the transport service as to their conformity with the conditions laid down and, if found satisfactory, provided with the military sign. The test of the motor as to its horse-power can be effected by an officer in the factory before being built into the chassis; generally speaking, accredited brake certificates will be accepted.

7. The army administration reserves to itself the right of testing the military efficiency of the vehicles several times a year.

8. An automobile may not be sold in Germany during the first five years after it has been put into working, unless the purchaser accepts the obligations resting on it in respect of the army administration. The sale of automobiles abroad is not permitted.

Conditions for the Construction of Light "Trains" Adapted for Military Purposes.

A—Military requirements.

1. The light army "train" consists of a freight vehicle and a trailer. The wagon shall be built to take a load of 4,000 kilos. on its own platform and 2,000 kilos. in the trailer.

2. Maximum speed over level roads shall not exceed 12 kilometres (7½ miles) for iron tires, or 16 kilometres (10 miles) for rubber tires. Average: 9 kilometres an hour (5.265 miles) for iron tires, 90 kilometres (56¼ miles) to be covered daily; 12 kilometres an hour (7½ miles) for rubber tires, with 120 kilometres (75 miles) as the daily total.

3. The train must take all gradients up to 1 : 8 on hard-surfaced roads with full load.

4. Supply of fuel must last, under favorable circumstances, for a run of 250 kilometres (156¼ miles); 80 kilometres (50 miles) in the case of steam-driven vehicles.

5. Body must be spacious enough to admit of the carrying capacity being used to the most advantage.

6. Track: up to 1.7 metre (approximately 5ft. 6in.); wheel-base must be adapted to any turns of the road.

7. Lowest point between wheels under full load not less than 20 centimetres (7.8 inches).

8. There shall be proper protection, against bad weather, for the men.

B.—Technical requirements.

(a) Vehicles.

1. Motor—at least 30h.p.

2. Motor, gear and vehicle must be made on thoroughly up-to-date lines.

3. The possibility of using home-produced fuel will be commended.

4. Braking arrangements must guarantee safety on all gradients.

5. Wheels shall conform with legal regulations and, by means of suitable contrivances (anti-skids), render possible the safe negotiation of roads which are coated with ice or snow.

(b) Trailers.

1. The trailer shall be built for a minimum load of 2,000 kilos, and sufficiently strong to allow of a second loaded trailer being attached.

2. Trailer must be fitted with safe-working brakes and sprags.

3. Trailer must be arranged for horse-draught and must carry the necessary appliances.

4. Coupling hooks for trailing arrangements on vehicle and trailer must lie some 85 centimetres (33.4 inches) above standing surface.

A 20-passenger motor bus is operated by the Columbus, Urbana and Western Traction Company of Columbus, Ohio, at the end of its electric line. The machine runs to Dublin and Hilliard.

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Roads and Motor Traffic

Highways Built for Infrequent Horse Traffic Are Not Adequate for Present Needs

SUCH roads as this or any other country possesses are manifestly unfit for continuous motor vehicle traffic. The best of them are none too good for light traffic of any kind, while if the volume of it should be increased to such an extent as recent industrial and social development leads us to believe will soon occur, it is almost certain they would prove utterly inadequate for common needs. This latter view of the subject is one which usually escapes the attention of the good roads agitators who are not far-sighted enough to perceive that motor transportation is destined to be the permanent mode of much of the travel of the future.

Obviously it is bad policy to build roads exclusively for horse traffic, which is in its decline. There is not enough of it to justify the expense of proper construction and maintenance, and as greater frequency of traffic can only come as a result of the universal employment of the motor car and the motor wagon it would be wiser to anticipate the early arrival of such a condition. Roads built for temporary needs represent a great waste of public money. Every economist knows that adequate provision must be made for the future. Public improvements should not be undertaken unless there is a reasonable certainty that much of their usefulness can be transmitted to posterity.

* * *

Every civilized nation that has extensively adopted the automobile is loud in its condemnation of roads as they exist to-day. We who are building an empire out of raw materials often covet the highways which imagination leads us to believe exist in European countries, while the inhabitants of those remote spots ceaselessly complain of their infirm construction. It is commonly supposed on this continent that English and French roads are of superexcellent quality. They are—for light traffic. But they are admittedly bad for motor vehicle traffic, channeling and pulverizing at a rate that fairly astonishes the experts who despair of keeping them in semblance of repair. England's plight may be imagined from the following remarks by a gentleman who has given more than ordinary study to its road conditions:

For fifty years the road after the advent of the railways was looked upon as a more or less negligible quantity in national affairs. One could ride or drive for a whole day without meeting one vehicle in every half mile, and on some roads, on which at the beginning of the nineteenth century there was a considerable amount of traffic, not a single carriage of any kind would pass in an hour. To keep up roads in good condition for such sparse traffic would have been waste of labor and of money. During the latter half of the century all the roads were suffered to deteriorate. People grumbled, but that was all. There was an instinctive feeling that to seriously ask for anything better meant an increase of tax rates without any corresponding practical gain. It was in this condition of things that our highways were found when the advent of power traction revived the road as a means of long distance communication. They were unfit for use as roads in the sense of being really ways for traffic.

Such having been the state of things, it is not to be wondered at when the roads began to be used once more, and a hundred vehicles passed in a day where five passed formerly, that the wear and tear on these villainously ill constructed and ill tended roads should have caused much breaking up of surfaces, and called for more outlay to put and keep in efficient order. Of course the blame was laid on the motor car. It was declared that it injured the roads more than did the horse traffic. This was quite untrue. The advent of the motor carriage added largely to the number of vehicles upon the road, and it was this, combined with the fact that the roads were already bad and incapable of carrying horse traffic without injury, which caused the outcry. But it was not realized that if horse traffic had suddenly been increased by several hundred per cent on the ill laid and ill tended roads the destructive effect would have been infinitely greater.

The cry was that power traction must be prohibited on the existing roads. On every hand one met with the suggestion that the motorist should be ordered off the roads and must have roads made for himself. It appeared to be the idea of those who had not taken up the new mode of road transit that the traffic should be regulated to suit the roads that were provided, however bad they might be, rather than that when there was a development of traffic the road should be kept up so as to carry it. The things that were said put one in mind of the story of the mother who made it a matter of complaint against her child that when she had provided—as she thought—suitable clothes, it had the impudence to grow out of them, and that if it chose to get so big as that it should find its own clothes.

The time has come when the motorist, in his own interest—which is in the end the interest of the whole community—must put forth every energy for obtaining improvement of the roads. He must din it into the ears of those who are dull of hearing on the matter that in improvement of the roads is to be found relief for present discomfort, convenience for pleasure and for commerce, economy in locomotion expense and great increase to the national wealth. Those who will not hear must be made to hear this; those who will not see what is before their eyes must be made to see.

There is no one now, who is not a fanatic or a lunatic in hatred of power traction, who does not know and confess, however reluctantly, that the power vehicle is a permanency on our roads, and that road traffic is becoming as important as it used to be in the days of the mail coach and the carrier's cart. And, as the population is so enormously increased since those days, the actual number of vehicles put upon the road will be very much greater than it has ever been before. The roads which were narrowed by converting their sides into green pastures for cottagers' cattle and hay-making grounds for the food of the road authorities' horses, must once more be widened to the extent necessary for safety and convenience. The most scientific system of road making must be adopted and efficiently carried out.

Locomotion will always be cheaper on good roads than on bad. For it will be faster and less injurious to the power used for haulage and to the vehicles. This is well illustrated by what happened in the early days, when the coach began to supersede the horse as the traveler's means of conveyance. Two instances will suffice. The first coach service between London and Dover, a distance of a little more than eighty miles, took three days to make the journey. The first coach service in Scotland, between Edinburgh and Glasgow, required two days to accomplish the distance, although it was only forty-two miles. Does anyone doubt that the improvement of the roads, which made it possible for these and other similar journeys to be completed in half the time taken at first, did not constitute an addition to the wealth-producing power of the country, diminishing the cost of wear and tear of animals and carriages, and the expense of the journeys to travelers, and facilitating the rapid transaction of business by intercommunication between one place and another being accelerated?

Everyone who is interested in motor traction, whether for pleasure or social purposes, whether for business facility or goods transit, or has the still more direct interest of being en-

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gaged in the manufacture of or dealing in power vehicles for whatever purpose, will act wisely if he devotes some energy to enforcing upon our authorities, legislative or administrative, the necessity of the present great revival of road use being encouraged by a wise and courageous policy of improving the roads, as a certain means of adding to the financial and social prosperity of the nation.

The time has come when the road is the one question of the day. The motor vehicle is now a thoroughly practical instrument for locomotion, whether for passenger or goods traffic. That its efficiency may not be handicapped by the badness of roads is the question of the hour—the one great question which it is the duty of all motor organizations and all motorists to press upon public attention, and upon which it is a duty to give the authorities no rest until the work of road improvement is taken up in a thorough manner and pushed on vigorously. That good roads can be made at a reasonable expenditure, when initial cost and subsequent maintenance are put together, is certain. The only thing that is uncertain is how long it will take to overcome the visinertiæ of officialdom.

The whole argument concerning road improvement turns upon the question of the function of a highway. If it is conceded that the roads are for traffic, then they should be constructed to suit all forms of it. If, on the other hand, it is maintained that the traffic must accommodate itself to the roads, and their condition may be whatever community ignorance and parsimony shall suggest, transportation will be painfully slow in developing and the earning power of a huge investment will be all but lost. Motor traffic being here to stay, it is only just that the elements which can enhance its value—good roads and good streets—should be provided.

ELECTRIC BUSES IN LONDON.

FOR a year past electric buses have been operating in London. Not many of them, it is true, but enough to direct general attention to the sureness and silence of their service. The machines, which are driven by motors contained in all four wheels, have been very popular. It is now proposed to put 150 more in commission.

The commissioning of so large a fleet of electric machines will be watched with a great deal of interest, especially by investors who have hitherto blindly believed that the gasoline machine, straight or modified, is the only type of bus worth perpetuating. The electric bus has never yet had an opportunity to demonstrate its economical or commercial worth. Apparently it is about to have its inning.

In some of the most recent examples of Renard road train construction the leading vehicle, which usually is the unladen tractor, carries loads up to five tons.

The Harrisburg Taxicab and Baggage Company has been formed to use motor vehicles in the Pennsylvania capitol.

The Empire Taxi-Motor Cab Company has been organized, with capital of $10,000, to compete for business in New York City.

The Commercial Motor Vehicle Company has been formed in Indianapolis to do a general haulage business. Its capital is $10,000.

RESULTS OF FRENCH TRIALS.

THE influence of military opinion was severely felt in the rules which governed the trials that were recently concluded in France. Penalties of the most oppressive character were authorized for mishaps which in ordinary commercial practice would be regarded as of extremely minor importance. One truck was disqualified because one of the blocks in its sectional tires became detached from the wheel rim. Another suffered the extreme penalty because its carburetter required roadside attention.

The tendency among military men who have had occasion to formulate thought upon the subject of motor wagon haulage is always to lay too much emphasis upon matters which do not greatly interest the commercial classes. They are much more particular about reliability than economy. Their indifference to the latter factor almost amounts to blindness.

Of the 48 machines which competed for awards 35 successfully completed the tour, which lasted for four weeks. All machines competing had many of their parts sealed. One division of the contestants covered 1,885 miles, while the other covered 2,428. Three wheelers, light wagons, trucks, buses, cabs and machines constructed for military service, were represented. The fuel of the military machines for a selected distance was alcohol. The cabs also were compelled to use alcohol for fuel. The trucks, wagons and buses, however, were permitted the use of any standard fuel. It was considered cause for disqualification that a tire, a rim or a wheel should be changed. Military vehicles were denied the use of rubber tires. Five of them were fitted with steel tires in front and wood tires in the rear. High speeds were not permitted.

First prize was awarded to the Saurer three-ton gasoline truck, whose total weight, including load, is six tons. This machine, of Swiss manufacture, was exhibited at the motor wagon show held in Chicago last winter, where it attracted considerable attention at the hands of designing engineers. Its fuel record in the trials was 69½ miles on 4.4 gallons of gasoline.

At the close of the trials the war department purchased six of the machines which had perfect scores.

OVER $2,000,000 FOR GOOD STREETS.

BEFORE long Indianapolis will be provided with street surfaces which will be the model for every first-class city throughout the country. During the past two years more than $2,000,000 has been spent on street improvements. From this statement one perceives how gross has been the neglect of the traffic surfaces in the past and how uneconomical they must have been for vehicle operations of all kinds. Within the past year and a half $1,084,843 has been expended in making and repairing streets. An appropriation of $640,705 is now being spent for the same purpose, and when this sum is exhausted $364,194 must be forthcoming in order to provide the better conditions which the traffic of the city demands.

At the beginning of this year there were only 1,778 motor wagons in use in Germany.

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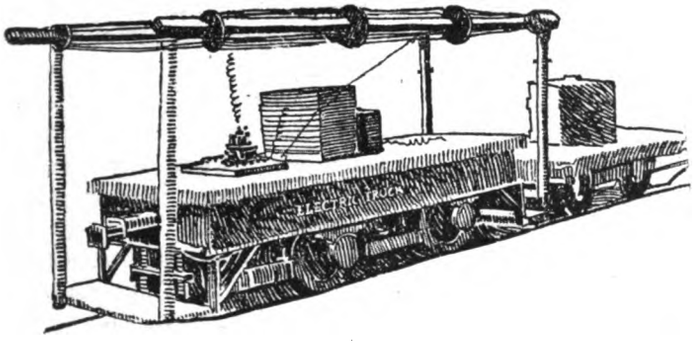
THAT "WIRELESS" ELECTRIC TRUCK.

SOME more particulars are available concerning the construction and operation of the "wireless" electric truck which is in use in the Omaha yards of the Union Pacific railroad. The truck, with its trailers, is capable of hauling large loads, ten tons being the maximum for the tractor and a like amount for each of the following units of the train.

The tractor, which weighs three tons, carries 144 feet of copper wire and antennae about two feet high. Through the latter the electric waves are picked up and transmitted to the machinery beneath the platform of the tractor. Similar antennae, built like a cylinder and attuned to the electric car, swing from the sixty-five-foot



flagpole at the central station, and from this flow the power waves which control the movement of the train. It is the first time antennae have been built in the shape of a cylinder.

In operation the waves are picked up by the throwing of a switch which connects the motor with the power gathering apparatus. When destination is reached another throwing of the switch cuts off the power and brings the truck to a standstill.

Another feature is a "traveling ground," something electricians have been endeavoring to perfect for years. This may eventually make possible wireless telegraphic communication with moving trains.

Motor bus service has been commenced between Mojave and Lone Pine in California. The two towns are 130 miles apart. The trip requires nine hours, including a stop of one hour at Little Lake for dinner. Three trips are made each week.

Milwaukee's city council has decided to purchase the motor patrol wagon which the police department has been testing for some time past.

The mayor of Cleveland, Ohio, is strongly in favor of equipping each of the city's police stations with a motor patrol wagon.

Official recommendation has been made that the city of Los Angeles purchase two motor hose and chemical wagons.

A company is being formed to operate motor cabs in Omaha.

LONDON'S MOTOR BUS CENSUS.

WHEN the last census was taken it was found that 1,052 motor buses were being operated in London. The distribution was as follows:

Vanguard Company	373
General Company	263
Road Car Company	237
Great Eastern Company	79
Thomas Tilling	35
Steam Omnibus Company	20
Electrobus Company	12
Miscellaneous owners	33
Total	1,052

ASCENDING A MOUNTAIN BY MOTOR BUS.

THE summit of Mount Hamilton, whereon the famous Lick observatory is perched, may now be reached by motor bus from San Jose, Cal., in two hours and forty-five minutes, including a stop of half an hour's duration. The service was inaugurated during the latter part of May. The machine used develops 40 hp., and is chain driven. It is hung low in order to insure stability in taking the numerous turns with which the ascent and descent is marked. Descending, the path drops 2,000 feet in seven miles.

MOTOR CABS ON EXHIBITION.

MOTOR cabs will be assigned a prominent place in the next show to be held in New York by the American Motor Car Manufacturers Association. A separate section of the exhibition hall will be devoted to these vehicles. Only one model made by each firm will be displayed. The show is set to take place during the week of Dec. 31-Jan. 7, in the Grand Central Palace.

MOTOR CABS FOR CLEVELAND.

MOTOR cab service will be commenced in Cleveland, Ohio, next month by the Cleveland Taxicab Company, which has been organized with $25,000 capital. Twenty-five vehicles will be employed at the outset.

A wealthy Dane has bequeathed his entire fortune to the government for the purpose of forming a military motor cycle corps. The government proposes to organize a company, consisting of 100 men, and equip it with machines fitted with rapid fire guns.

Between 5,000 and 6,000 passengers are carried daily in the vehicles of one of New York's motor cab companies. Three hundred machines are operated in the service.

The introduction of the motor bus into Dublin, Ireland, provoked the "jarvies", as the jaunting car drivers are called, to such a pitch of indignation that rioting ensued.

Two more motor cab companies are being formed in London, both with capital stock of $1,000,000.

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LONG DISTANCE BUS LINE.

EVER since the founding of the little town of Eureka, north of San Francisco, the people have been practically isolated from the outside world, except by means of steamers and an old broken down stage line which has made trips at intervals between the seacoast town and Sherwood, on the railroad, a distance of 140 miles.

The California Northwestern railroad has promised the citizens of Eureka time and again that a railroad would be constructed, connecting the two places. Not wishing to be put off any longer, several of the leading townsmen of Eureka formed a company early this year and incorporated with $25,000 capital. With part of this sum they purchased the stage line and equipment of the old transportation company, which was about to become extinct, and with the remainder purchased five automobiles which on June 1 started on a regular schedule between Eureka and the inland town of Sherwood, there to connect with the railroad leading directly to San Francisco.

After gaining control of the livestock and old stage coaches used between the two towns, the corporation secured the mail contract for the handling of Uncle Sam's matter between the two places.

The schedule which was finally decided upon for the trip was sixteen hours for the night run and twenty-two for the day run. The night run will be known as the "Fast Mail." The day run of twenty-two hours will be for passenger service exclusively. Stops will be made at all the intervening towns on this run. The passenger travel for the first few days was exceptionally high, probably owing to the novelty of the undertaking. The rates charged are practically the same as by the California & Northwestern railroad for a similar distance.

By the establishing of this new line of automobile stages Eureka is put into communication with San Francisco by a direct line, which will prove of great assistance to the growing little seaport town of the north, insofar as colonization is concerned.

Motor bus service is to be supplied between Atlanta, Roswell, Dahlonega and Gainesville in the state of Georgia. Four machines will be employed. The operating company has a capital of $40,000.

Business men of Carthage, Miss., are actively endeavoring to provide motor bus service between that point and Canton, believing that the traffic will easily sustain the enterprise.

San Bernadino and Rialto (Calif.) are to be connected by motor bus. The two points are 3½ miles distant.

Within a short time motor buses will be plying between Pattersonville and Schenectady, N. Y.

Motor bus service is to be supplied between Cumberland Gap and Middlesboro, Md.

VEHICLE TAX AGAIN UPHELD.

NO VEHICLE using the streets of Chicago, whether operated for profit or pleasure, is exempt from the tax imposed by the city council for the maintenance and improvement of the streets. Such is the opinion of the state supreme court.

The lower courts held that the statute and the ordinance were constitutional so far as they relate to vehicles used for business purposes, but that vehicles used for pleasure were exempt from taxation under the provisions of the law. The meat of the opinion rendered by the State Supreme Court is herewith presented:

"It is urged that the legislature is without power to authorize the City of Chicago to pass an ordinance requiring vehicles using its streets to pay a license fee for keeping the streets and alleys in repair. We think it clear that a license may be imposed and the fee for such a license collected with a view to revenue only, and if such be the law the fact that the license required to be paid by said ordinance in this case is for revenue only does not render the statute under which the ordinance was passed and the ordinance itself unconstitutional."

With the revenue which will be available from taxation it is believed that from 80 to 100 miles of streets can be improved every year.

The council of Bridgeport, Conn., has authorized the purchase of a motor ambulance. To secure the machine the sum of $3,500 has been made available through the sale of produce raised on the city farm.

It is quite likely that Denver's largest hospital will soon be provided with a motor ambulance, as its medical directors are complaining of the inadequacy and slowness of the horse drawn vehicles now employed.

A sight seeing machine is being operated between La Porte, Morgan's Point, Bay Ridge and Sylvan Beach in Texas. Special trips are made to the San Jacinto battle ground.

A motor bus line is being operated between Rocheport, Columbia and Ashland in the state of Missouri. Light freight will be transported as well as passengers.

A company is being organized to supply motor bus service between Greensburg and Versailles, Ind. Motor road freighting will later be undertaken.

The economy of a combination motor police patrol and ambulance is being discussed by the authorities of Leavenworth, Kan.

A company with $25,000 capital has been formed to operate motor buses from Durham, N. C., to neighboring points.

Motor buses are operating between Marysville and Hammonton, Calif.

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WILL MAKE RELIANCE TRUCKS.

THE manufacture of Reliance motor trucks will in the future be carried on by the Reliance Motor Truck Co. of Owosso, Mich., which company has been organized for the purpose of acquiring the assets and goodwill of the Reliance Motor Car Co., of Detroit. Within ninety days the Owosso company will have its factory erected. Meanwhile business is being carried on at the old plant in Detroit.

The new company has been organized with capital stock of $250,000, of which $150,000 is represented by cash and working material. The land and buildings necessary for the Owosso plant will be furnished by the local improvement association, which is composed of the more important business men of the city. Both will be furnished free of charge for a term of years. When certain amounts of money have been paid out in wages during the next five years the property will be turned over to the Reliance Motor Truck Company. The officers of the new company are as follows: President, Fred O. Page, Detroit; vice-president, Alvin N. Bentley, Owosso; secretary and treasurer, W. F. Benkelman, Owosso. Thomas Lynn and D. M. Christian are directors of the company.

TRACTIVE EFFORT AND WHEEL DIAMETERS.

EXPERIMENTS conducted at the Columbia Agricultural Experiment Station in Missouri show that 21 per cent less power is required to move a vehicle equipped with 55-inch rear wheels than is needed for one which is fitted with 28-inch wheels.

The tests were made with a farm wagon loaded to 2,000 pounds, the cross diameter of all the wheel tires used being six inches. Three sets of wheels were used, one being 44 inches diameter in front and 55 inches in the rear, another 36 by 40 inches, and the third 24 by 28 inches. It was found that the tractive advantages of high wheels was most noticeable on rough roads. Low wheels proved most destructive of road surfaces, cutting deeper ruts than high wheels. The convenience of low wheels especially in turning, was allowed. Diminishing the height of wheel from 44 to 36 inches in front, and 55 to 40 inches in the rear, did not increase the draft in as great a proportion as it increased the convenience of loading and unloading ordinary farm freight. Diminishing the height of wheels below 30 inches front and 40 inches rear increases the draft in greater proportion than is gained in convenience.

The use of axles of equal length, broad tires, 30 to 36-inch front wheels, and 40 to 44-inch rear wheels was recommended. As an average of all the tests made on gravel roads it was found that the high wheels drew 2.1 per cent lighter than the low ones, the medium wheels drawing 18.8 per cent lighter than the low ones.

Two women drive motor cabs in Paris.

The Motor Taximeter Cab Company has been formed in New York City with $150,000 capital.

TRACKLESS TROLLEY WAGON SERVICE.

MANY of our large cities have at one time or another been marked by imaginative speculators as profitable fields for the exploitation of trackless trolley wagon service. If there was ever any serious intention of developing such enterprises the cool reception accorded them must have been responsible for their retirement. At one time it was thought that a Pittsburg traction magnate would adopt the system, but his commercial courage did not equal his ambition and the project languished until eventually it was no longer heard of. It was his plan to use express wagons on the street car rails, deriving power from the overhead trolley, and letting deviations from the fixed line of travel be taken care of by the storage battery with which the vehicles were to be equipped.

The trackless trolley method of carrying merchandise or passengers may yet be very extensively applied in this country, but if it is it will feed rather than supersede the system now being built up. Here and there throughout Europe it is being applied with some degree of success, but wherever it is seen it does not appear to have dispossessed any older form of transportation. Of one such service in Italy we are permitted to know a few meager details. The route, which is an extension of a street car service, is ten miles in length. Power is furnished from the central station to the overhead wire, with which two buses and a wagon are connected by trolley poles. The rear road wheels of these vehicles are driven through clutches and side chains. The operating expense is said to be four cents per vehicle kilometer.

CHICAGO'S MAIL DELIVERY CONTRACT.

IN APPEALING to Congress for a continuance of tunnel mail service the associations which undertook to champion that lost cause presented the following statements and statistics which will be read with great interest by those who hope to see the next mail contract awarded to a firm which will operate motor wagons:

Chicago is the greatest mail transfer point on this continent, and the most efficient transfer service should be employed.

Cost of equipment, labor and incidentals to the wagon service is 25 per cent greater than in 1903; daily tonnage of mails has increased by 80 per cent; the wagon contractors failed in 1903, and have increased their bid by only $39,000 for the coming year.

As to efficiency in the past, the failures recorded against the wagon contractors were too numerous to mention.

Reconstruction and rehabilitation of the street car lines must be completed within the coming two years, adding greatly to the congestion in the loop.

Work on the new subways is to begin before the wagon contract shall expire, hampering transportation within the loop.

It is rumored that a well financed company will soon undertake general motor trucking upon a large scale in Chicago. Machines of all ratings will be employed, probably 100 of them.

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Wagon Maintenance

Tips to New Drivers and Caretakers About Things Likely to Escape Their Attention

ALTHOUGH it is necessary to remove the muffler and take it entirely apart in order to clean it thoroughly, it is possible to effect a very satisfactory temporary clearing of its choked passages by tapping it lightly all over with a hammer. The result is that a considerable portion of the sooty accumulation within it is knocked off the walls and is blown out through the exhaust pipe.

* * *

Alignment of Engine and Gear Case.

Strict accuracy in the alignment of the engine and gear case is not called for in cars which have a universally jointed piece between these two units, but non-alignment in cars not so provided is productive of various troubles. With the clutch making a comparatively rigid connection, it is obvious that bending strains will be set up in the shaft and also binding in the bearings, which also means absorption of power, excessive and uneven wear on the bearings, and deterioration of the shaft through crystallization. In the common type of cone clutch, where the flywheel forms the female member and the male is mounted on the first shaft of the gear box, non-alignment will be indicated by slipping of the clutch, but in clutches of the self-contained variety, having both members carried on the same shaft, this indication, if present, will be due to other causes which will be considered later. It is seldom possible to dismount either member of a cone clutch of the above type without first moving either the engine or gear case, so before doing this try a feeler between the two members when the clutch is in. Feelers for this sort of work consist of thin blades of steel of different thicknesses hinged in a handle like a pocket-knife, and can be purchased at any tool makers. If it is found that the feeler can be inserted at one side of the clutch and not the other, the gear box must be moved one way or the other to bring it true, or it may have to be raised or lowered a trifle. Thin pieces of tin or sheet brass under the arms are usually employed for this purpose, and, by adding to or taking from these, the desired position is obtained. When it has been adjusted so that it is impossible to get the thinnest blade of the feeler inserted at any point after the holding down bolts have been tightened up and the clutch let in, the alignment will be sufficiently correct. In clutches of the expanding type the same course may be followed, but in either case the slipping may be due to other causes.

* * *

Care of Selective Gears.

In wagons employing the selective method of gear changing it is very essential that the telescoping shafts of the brake and gear mechanisms be kept clean and well lubricated at all times. The gear rocker shaft in particular, on account of its rotative and longitudinal motions, tends to accumulate sand and dust from the road, and transfer it gradually through the entire length of the shaft, and into the gear box, if that enclosure happens to be in direct communication with it. On this account the external portion of the shaft should be kept as free from oil as possible and carefully cleaned whenever the machine has been exposed to muddy roads. Lubrication should be provided only through the regular oilers, but at frequent intervals, care being taken not to use an excess of oil in any case.

* * *

Keep Brake Connections Straight.

Whenever through a minor accident any of the connections leading to the brakes become bent, they should be returned to their original alignment at once. Such kinks not only shorten the adjustment, thus altering the ratio of application to pedal or lever movement, but may be the seat of an incipient fracture.

* * *

Some Radiator Troubles.

Frequently a radiator will suddenly begin to act badly and the driver notes that, although the engine is overheating, the radiator itself is cool. This generally means that the pump is not working, or, if the latter is in operation, that the water is not going through the radiator, but is being by-passed at some point. A steam pocket in the piping will also produce similar results. When the water boils for a minute or two after stopping the water, the radiator is probably a little too small. The geared pump in stopping of course stops the water flow, and the still water in the cylinder jacket continues to heat to the boiling point, producing steam and forcing the water out of the overflow. This can sometimes be overcome by steam venting the top of the water jackets or the radiator inlet pipe. It can also sometimes be overcome by substituting a rotary pump for the geared one, so that the water can flow by thermal currents even after the pump has stopped.

* * *

Neglect of the Engine Fan.

Very many drivers seem to think that the engine fan is of little importance. It may often be discovered with a broken belt or chain. The fan should be kept in good condition. If this is not done the efficiency of the power plant will be decreased.

Your attention is called to the simplicity and economy of Westinghouse Mercury Rectifier Outfits for charging automobile batteries. They give 40 or 120 volts direct current from a 110 or 220 volt alternating current circuit, and will charge any number of cells between 12 to 44. They will save the automobile owner $15 to $20 every month.

Full particulars in Circular 1148.

Westinghouse Electric & Mfg. Co.
PITTSBURG, PA.

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Information for Buyers

THE FRANKLIN ALCOHOL MOTOR.—Writing of its efforts to develop an alcohol motor, the H. H. Franklin Mfg. Co., of Syracuse, says: "With a view of investigating the merits of the alcohol motor our engineering force, under the direction of Head Engineer Wilkinson, has conducted continued tests. At first the results obtained did not warrant the belief that there was an immediate future for the alcohol motor. At that time it was pointed out that even if alcohol and gasoline could be purchased at the same price per gallon the gasoline motor would be the most economical for the reason that there was a great deal more energy in a given amount of gasoline than in a given amount of alcohol. Now our engineers have so far perfected the alcohol motor that it is, size for size, as powerful as a gasoline motor. The former tests were with a regular gasoline motor converted to use alcohol. Under the knowledge gained by these experiments the Franklin engineers designed and built from the ground up a motor adapted to alcohol use. Much to their satisfaction this motor is thoroughly practical in every respect for motor car use. Only 90 pounds compression is used as against 150 pounds used by the United States government in its tests, and the results equal the results of the government tests. Compression above 90 pounds is hardly practicable for automobile car motors. With this, improved motor alcohol is as econnomical to use as gasoline, with both at the same price per gallon. This motor shows a consumption of alcohol per brake horsepower hour of about 1.05 pounds. There is every reason to believe that the price of alcohol will be reduced gradually, so that the alcohol motor is certainly going to play a very important part in the industry. The fact that alcohol is much safer than gasoline is greatly in its favor. Contrary to the prediction by eminent foreign experts, the alcohol produces no bad effect on the motor itself. These experts have expected that in process of combustion certain chemical compounds would result that would be detrimental to the working surface of a motor. Our engineers declare that not anything of this kind occurs. The successful working out of the alcohol motor is an achievement of unusual importance. The problem has engaged the attention of the governments of France, Germany and the United States for some time, and the results of these government tests have been watched with a great deal of interest. Our tests have been conducted exclusively with the Franklin air-cooled motor."

* * *

MERCURY RECTIFIER HELPS SALE OF ELECTRICS.—Few people realize the extent to which electrically-driven automobiles for business and pleasure purposes are being used at the present time. In Chicago alone there are over one thousand electrics used for pleasure, and in such cities as Cleveland, Rochester, Syracuse, New York, Denver and Indianapolis, more electrics will often be seen on the streets and boulevards than gasoline cars. The majority of these cars are housed, charged and cared for at near-by automobile garages, and while the monthly rates charged by these garages is such that the cost of continuous maintenance and operation of such vehicles is not excessive, a very considerable decrease in such cost is effected when they are housed and cared for upon the premises of the user. When the electric vehicle can be housed on the premises it is often possible to make a great saving in the cost of operation, it being not unusual for a victoria or stanhope to be maintained at a cost of not over $15 per month, including cost of charging and all repairs. In the majority of instances the only kind of current available for the charging of an electric is the alternating current, and before utilizing such current for charging purposes it is necessary that it be changed to a direct current. Recently a device known as a mercury arc rectifier has been perfected. It is so simple that any one can operate it, and so low in cost that it will without doubt be installed by the majority of owners of electrics who have suitable shelter for the storage of their cars. The Studebaker Automobile Company, of South Bend, Ind., is selling a great many of these rectifiers in connection with their electric cars and claim that this device will do much to increase the sale and use of electric vehicles.

* * *

FIRE DEPARTMENT VEHICLE TIRES.—From the fire department of greater New York the Diamond Rubber Company received in May an order for 14,000 pounds of solid rubber tires. To this order 12,000 pounds addi ional were added on June 10, making a total of 26,000 pounds of rubber the Diamond Company is to furnish for the year. The tires are of the internal wire and side wire type, and cover a great variety of sizes. A strong argument for the use of rubber tires in fire department work is the fact that they do not cut the hose, as engines, trucks, etc., arriving late at the scene of any fire drive over the lines that have been laid.

* * *

REMARKABLE COMMERCIAL GROWTH.—Eight years is the short period of time, but it was long enough for the Firestone Tire & Rubber Company plant to grow to its present enormous size. When the business was started a small one-story structure was the extent of the plant. Additions were repeatedly made necessary until to-day it is the largest factory in America devoted exclusively to the manufacture of rubber tires both solid and pneumatic.

* * *

MORE MOTOR FIRE APPARATUS WANTED—Two more motor vehicles are to be purchased for the Springfield (Mass.) fire department, and it is expected that the contract for their construction will be awarded to the Knox Automobile Company.

CLASSIFIED ADVERTISING.

Advertisements under this heading are charged for at the rate of three cents a word including address; minimum charge $1 *for each insertion; no illustrations; cash must accompany order.*

FOR SALE CHEAP—Electric machines: one two-ton truck, special model Pope Waverly; four Pope Waverly delivery wagons; one express type, Electric Vehicle Co. If interested write for full detail and prices to Dept. of Stores, Birmingham Railway, Light & Power Co., Birmingham, Ala.

FOR SALE CHEAP—Two forty-passenger, terraced, electric, sight-seeing automobiles, in excellent condition. Apply to F. C. Berens, Bond Building, Washington, D. C.

FOR SALE—Two Packard trucks fitted for sight-seeing, complete; bodies or tops removable; address Wilson, Box 93, Savannah, Ga.

The Hubbard Patent Tire

Made of rubber blocks held in a Steel Rim with bolts that have a Steel Washer or Cap to cover the face of the rubber to protect it from wear.

Arthur H. Middleton
2821 N. Broad St., Philadelphia, Pa.

ATTRACTIVE ARRANGEMENTS CAN BE MADE FOR RENEWALS FOR "Exide" VEHICLE BATTERIES

THE GENUINE "EXIDE" PLATE HAS "EXIDE" MOULDED ON THE LUG AND IS MANUFACTURED BY

THE ELECTRIC STORAGE BATTERY CO. PHILADELPHIA

SALES OFFICES: NEW YORK BOSTON CHICAGO ST. LOUIS CLEVELAND ATLANTA SAN FRANCISCO TORONTO

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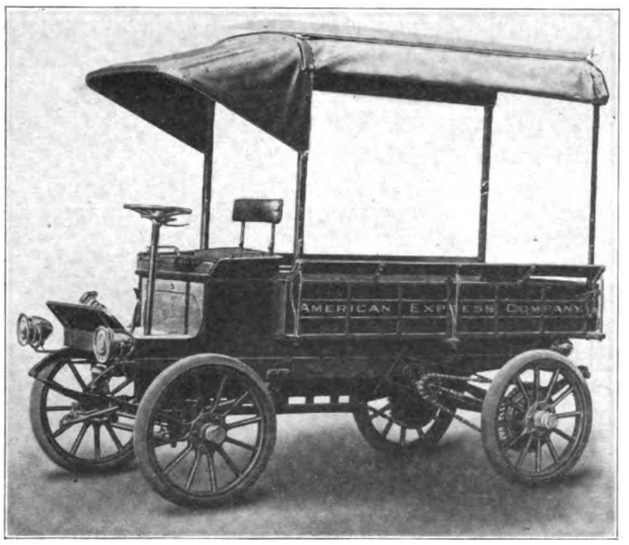

BAKER ELECTRIC
Commercial Express Wagon

In the production of the Baker Electric Commercial Chassis we have avoided a crudeness which has heretofore seemed inseparable from the Commercial Vehicle.

We have combined **Simplicity** and **Efficiency** in a manner heretofore unknown in any Commercial Vehicles of the Electric Type.

Our Commercial Chassis is the acme of simplicity in construction and is the result of machine-like precision in design, workmanship and the selection of high class materials for the best results.

Efficiency is synonomous with **Baker** reputation, and **Baker Quality** is known the world over.

Any type of body can be supplied in connection with our Commercial Chassis. We are prepared to make prompt deliveries and will be glad to figure with you on your Commercial Electric Vehicle requirements. Write for further details.

The Baker Motor Vehicle Co.
44 W. 80th Street, CLEVELAND, OHIO

Knox

Prices vary from $1,400 to $5,500.

Trucks one to four tons capacity.

Commercial Cars

¶ Are right in design, construction, power and price. They are easy on tires and can be relied upon for constant service. They represent the perfection of eight years' experience.

¶ We are the oldest and largest makers of commercial cars in U. S. A. We make delivery vans, drays, police patrols, combination chemical and hose cars, ambulances, hotel and passenger buses.

Send for Illustrated Catalogue "B."

KNOX AUTOMOBILE COMPANY
Member A. L. A. M. SPRINGFIELD, MASS.

Westinghouse
Power Wagon Motors

Are designed and constructed to withstand all the power that can be applied to them in the propulsion of the vehicles for which they are built

Send for Circular 1059, it gives particulars

Westinghouse Electric & Mfg. Co.
PITTSBURG, PA.
Sales Agent. American Distributing Co.
American Trust Building CLEVELAND, OHIO

Greater
DURABILITY
ECONOMY
EFFICIENCY
and
ABSOLUTE SECURITY
insured by an equipment of

SWINEHART TIRES
for commercial vehicles

With quick detachable rim, no delay is necessary in renewing tires. No bolt heads or side wires to contend with.

LET US PROVE IT TO YOU.
SWINEHART CLINCHER TIRE & RUBBER CO., AKRON, OHIO
NEW YORK, 875 7th Avenue. CHICAGO, 1231 Michigan Avenue

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AUTOMOBILE SUPPLY CATALOG. — The Motor Car Equipment Co., of 55 Warren street, New York, has just issued its new catalog of automobile supplies. Over 2,000 items are illustrated, described and priced. There is nothing in the catalog which is not sufficiently high grade to carry with it the guarantee of a house that has never failed to keep its word.

The Hubbard Patent Tire

Made of rubber blocks held in a Steel Rim with bolts that have a Steel Washer or Cap to cover the face of the rubber to protect it from wear.

Arthur H. Middleton
2821 N. Broad St., Philadelphia, Pa.

SUPPLEMENTARY SPIRAL SPRINGS
GRAHAM PATENT

Teaming Without Breakage

Save your tires, your engine, your patience and nerves. Booklet 15 free.

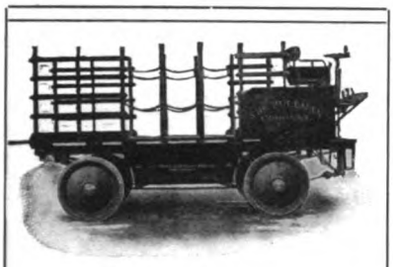
Supplementary Spiral Spring Company
780 Broadway New York (near 59th St

ATTRACTIVE ARRANGEMENTS CAN BE MADE FOR RENEWALS FOR **"Exide"** VEHICLE BATTERIES

THE GENUINE "EXIDE" PLATE HAS "EXIDE" MOULDED ON THE LUG

THE ELECTRIC STORAGE BATTERY CO. PHILADELPHIA

SALES OFFICES: NEW YORK BOSTON CHICAGO ST. LOUIS CLEVELAND ATLANTA SAN FRANCISCO TORONTO



4 Wheel Drive
4 Wheel Steer
4 Sizes, 1 to 5 tons

The Indestructible Couple-Gear

¶ Constructed throughout from cast steel and forgings. Power applied direct to rim of wheels.

¶ No countershafts, sprockets or chains to maintain. Electric transmission. Either Generator or Battery driven.

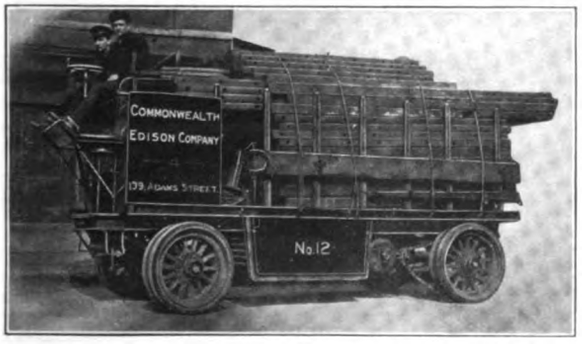
WRITE FOR CATALOGUE. AGENTS WANTED.

COUPLE-GEAR FREIGHT-WHEEL COMPANY
550 Buchanan Street, GRAND RAPIDS, MICH.

Manufacturers and Owners of Commercial Electric Vehicles

will find the Commonwealth Edison Company ready at all times to co-operate in any way in improving and perfecting the service of this type of truck, which has grown constantly in popular favor the past few years.

A number of Chicago's largest commercial houses are utilizing electric trucks with notable success; and more would doubtless use them if they were familiar with the superior facilities provided for their use.



We Maintain Charging Plugs

at nearly all of our stations and sub-stations for the accommodation of those operating electric vehicles of any kind.

We would be glad to advise any one in Chicago contemplating the purchase of an electric vehicle as to where they may make arrangements for charging and up-keep.

We Install Charging Outfits for Private Use

anywhere in Chicago and can refer to a number of installations.

We solicit correspondence from manufacturers of traffic vehicles; also from those intending to purchase.

Commonwealth Edison Company
139 Adams Street

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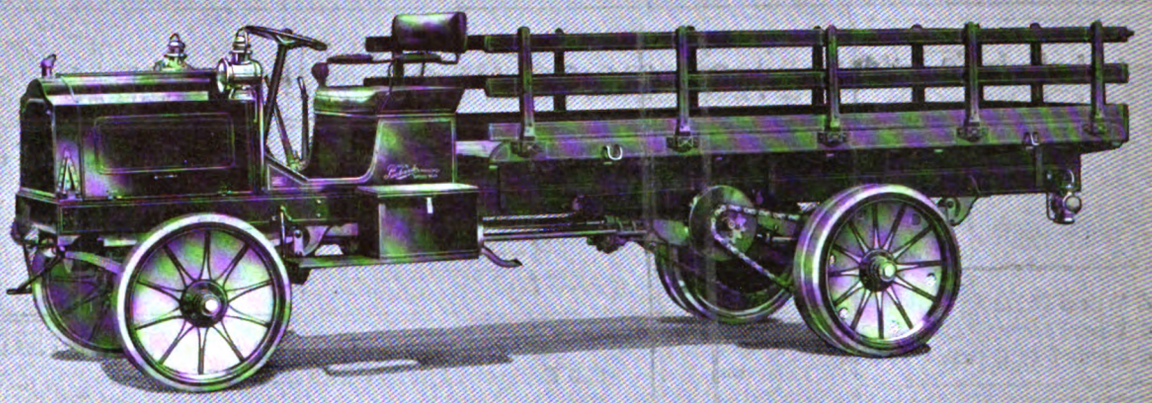
Packard TRUCK



Normal load capacity, 3 tons. Price, in standard equipment and finish, $3,850, f. o. b. factory. Special bodies to order.

"BUILT ENTIRELY IN THE PACKARD SHOPS"

Packard Motor Car Company
Detroit, Michigan

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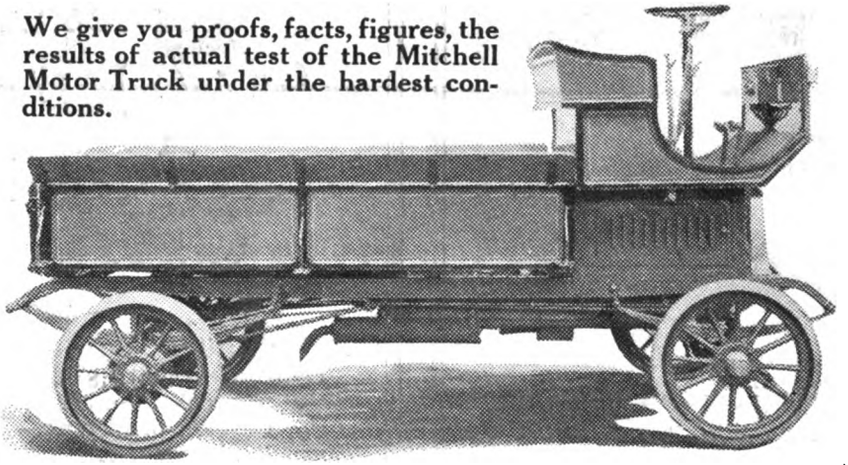
DON'T TAKE MERE CLAIMS OF LOW OPERATING COST!

Mitchell Motor Truck Four-Cylinder 20 H. P.

We give you proofs, facts, figures, the results of actual test of the Mitchell Motor Truck under the hardest conditions.



Capacity One and a Half Tons

4-Cylinder, 20 H. P. Capacity One and One-Half Tons

This is the Motor Truck—the Mitchell—with new and important improvements—which carried a load of 3,400 pounds from Racine, Wis., to New York over some of the worst roads in the United States—made doubly worse by rains—at an actual operating expense of 3.373 cents a mile, **paying the highest price for gasoline and oil along the way.**

Had the truck carried its own gasoline and oil the operating cost **would have been cut squarely in two,** as no owner has to pay such prices for fuel and lubricants as were charged against this machine on this trip.

1,168 miles through mud nearly up to the axles—roads that ordinary automobiles could not "negotiate."

That was undoubtedly the greatest practical test ever made of a motor truck.

Although the Mitchell Truck took this trip a year ago, it is valuable to the Motor Truck user as a **fact** against a multitude of unsupported claims.

You read the assertion of this or that manufacturer that his machine will run at an average of so many cents per mile.

Merely his word for it—not a single item of **performance** on which to base the figures.

This is different. This is **evidence.**

You would doubtless never have to run your Mitchell Motor Truck under conditions as hard as those of the test trip.

But it gives **solid facts** to figure on—8.848 miles on one gallon of gasoline, and 73 miles on one gallon of lubricating oil.

We said the "Mitchell with important improvements."

Since that splendid exhibition we have increased the efficiency of this machine wherever it could be increased.

We have supplied it with a much stronger transmission. We have fortified it in every part possible for even greater demands. In this we have had the invaluable light of this practical test.

Now we offer you—**for $2,000**—an even better machine than that which went the Racine-New York route.

Mitchell

Wheel Base	110 Inches	Tread	56 Inches
Wheels (front), Solid Tires			30x3 Inches
Wheels (rear) Solid Tires			30x3½ Inches
Body, Width (inside measurement)			3 Feet, 7 Inches
Body, Length (inside measurement)			8 Feet
Body, Depth (inside measurement)			14 Inches
Engine, 4-cylinder, Vertical			20 H. P.

Ignition, Magneto and Dry Batteries.
Transmission, Sliding Gear, Three Speeds and Reverse.
Carrying Capacity, 1½ Tons; Axle (front), I-Beam; Axle (rear), Worm Drive
Weight of Truck, complete . . . . . 2,300 Pounds

$2,000

Remember the Mitchell Motor Truck is built in the home of the famous Mitchell Motor cars.

It has all the features of excellence and of material and workmanship that mark the great Mitchell line. It is built entire in the Mitchell factory—not "assembled."

We build the engines. We grind the pistons. We cut the gears. We caseharden the steel. Our crank shaft has 5 large bearings as well as ball thrust to take up lateral shocks. Other crank shafts have only two.

Throughout the car, wherever the best results can be secured, nickel alloy and vanadium steels are used liberally.

These steels are employed in the crankshaft, transmission and rear axle shaft—in all the driving mechanism. The springs are vanadium steel. Aluminum casting are used wherever possible, strengthened with bronze wherever there is any strain.

And **remember,** the Mitchell Motor Truck with its low proven cost of operation—sells for only $2,000.

Write us!

Mitchell Motor Co., 560 Mitchell St., Racine, Wis.

Standard Manufacturers A. M. C. M. A.

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"Firestone"

Side-Wire Solid Rubber Motor Tires

Have made possible the success of the Motor Truck. Unless kept regularly at work these vehicles are an expense instead of an economy. Experimenting with tires causes loss of time, vexatious interruptions and liability to accident. Firestone Tires are no experiment—they are the established standard—they are an economy.

"Economy" is the watch word in commercial vehicles.

THEN WHY NOT "FIRESTONE"?

FIRESTONE TIRE & RUBBER COMPANY

Main Offices and Factory, AKRON, OHIO. **Branches and Agencies Almost Everywhere.**

Don't Use BELTS On Short Drives

If you run them loose, there's a power loss from slip. Run them tight, and the loss shows up as extra journal friction, a worn bearing, and perhaps as a "hot box." There is no happy medium. The efficiency changes with the initial tension. But you still lose as long as there is any initial tension at all.

There is no initial tension on a **DIAMOND CHAIN DRIVE,** no power consumed except in doing useful work. If you want machines with troubleless and cool bearings, low internal friction, speed like clockwork; if you haven't time to waste with dope and lacings, if you like a compact, neat drive, and want the most reliable transmission that your money will buy, give **DIAMOND CHAIN** a trial on one machine.

Get our engineers' help FREE on Transmission problems.

Write for book "Power Chains and Construction of Sprockets."

DIAMOND CHAIN & MFG. CO.

(CAPACITY, 8,000,000 FEET PER YEAR)

243 West Georgia Street **INDIANAPOLIS, INDIANA**

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Opens New Year's Eve

Dec. 31 to Jan. 7 Finest Decorations by S. R. BALL CO. ever offered at any Motor Car Exhibition

Leading American Cars—All the Foreign Cars direct from the Paris Salon—All Accessory Makers.

Commercial Vehicles
Motor Cycles
Taxicabs
Gasolene
Electric
Steam

Management of
AMERICAN MOTOR CAR
MANUFACTURERS' ASSOCIATION

GRAND CENTRAL PALACE NEW YORK

Forty-third Street and Lexington Avenue

ADMISSION 50c TUESDAY $1.00

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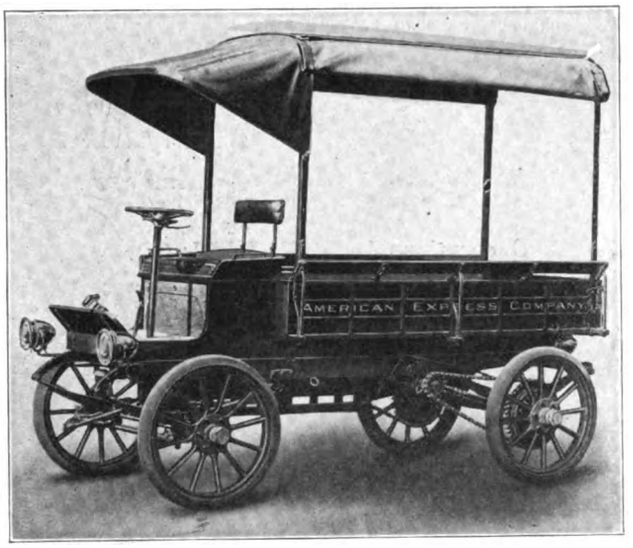

BAKER ELECTRIC
Commercial Express Wagon

In the production of the Baker Electric Commercial Chassis we have avoided a crudeness which has heretofore seemed inseparable from the Commercial Vehicle.

We have combined **Simplicity** and **Efficiency** in a manner heretofore unknown in any Commercial Vehicles of the Electric Type.

Our Commercial Chassis is the acme of simplicity in construction and is the result of machine-like precision in design, workmanship and the selection of high class materials for the best results.

Efficiency is synonomous with **Baker** reputation, and **Baker Quality** is known the world over.

Any type of body can be supplied in connection with our Commercial Chassis. We are prepared to make prompt deliveries and will be glad to figure with you on your Commercial Electric Vehicle requirements. Write for further details.

The Baker Motor Vehicle Co.
44 W. 80th Street, CLEVELAND, OHIO

The Garford Company
ELYRIA, OHIO

MAKERS OF THE
CELEBRATED
"GARFORD"
Touring Car
CHASSIS

—ALSO—

Brakes, Artillery Hubs—Heavy Steering Gears—Hangers, Counter Shafts—Reduction Gears and Sprockets—Parts for Power Wagons—Gasoline or Electric—Parts for Power Wagons—Light and Heavy—Equipment "L" makes the Best Light Electric yet produced.

Sold by AMERICAN DISTRIBUTING CO.
American Trust Building
CLEVELAND, OHIO

Westinghouse
Power Wagon Motors

Are designed and constructed to withstand all the power that can be applied to them in the propulsion of the vehicles for which they are built

Send for Circular 1069, it gives particulars

Westinghouse Electric & Mfg. Co.
PITTSBURG, PA.
Sales Agent. American Distributing Co.
American Trust Building CLEVELAND, OHIO

Greater
DURABILITY
ECONOMY
EFFICIENCY
and
ABSOLUTE
SECURITY
insured by an equipment of
SWINEHART TIRES
for commercial vehicles

With quick detachable rim, no delay is necessary in renewing tires. No bolt heads or side wires to contend with.

LET US PROVE IT TO YOU.
SWINEHART CLINCHER TIRE & RUBBER CO., AKRON, OHIO
NEW YORK, 875 7th Avenue. CHICAGO, 1231 Michigan Avenue

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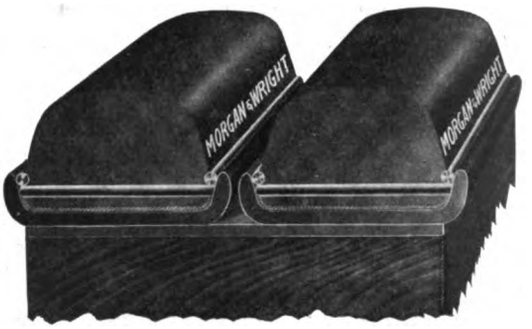
Morgan & Wright Side-Wire Motor Tires

have the necessary toughness of compound and strength of fastening to stand being driven over car tracks and broken pavements.

Such a tire is the only kind that will give satisfactory service on a city driven truck.

MORGAN & WRIGHT, Detroit, Mich.



Pressed Steel Truck Frames

The extensive tool equipment of the A. O. Smith Co. permits of the approximation of *your own design* without the necessity for new tools. :: :: Send drawings for estimates.

A. O. SMITH Co., 251 Clinton St., Milwaukee

FOR HEAVY LOADS—FOR HARD WORK

AND THE PRICE IS RIGHT

Diamond

WIRE MESH BASE

TIRES

They wear far beyond the commonly accepted limit.

The Diamond Rubber Co.

AKRON, OHIO

BRANCHES

NEW YORK, 1876 Broadway.
CHICAGO, 1523-31 Michigan Ave.
BOSTON, 223 Columbus Ave.
PHILADELPHIA, 304-6 North Broad St.
BUFFALO, 715 Main St.
CLEVELAND, 1514 Euclid Ave.
PITTSBURGH, 6122 Center Ave., East End.
DETROIT, 258 Jefferson Ave.
ST. LOUIS, 3963 Olive St.
MINNEAPOLIS, 117 S. Sixth St.
LOS ANGELES, 1207-9 Main St.
SAN FRANCISCO, Mission and Second Sts.
KANSAS CITY, 1408-10 W. 11th St.
CINCINNATI, 1673 Central Ave.
DENVER, 1735 Arapahoe St.
MOBILE, 107 and 155-65 Commerce St.
NEW ORLEANS, 530 Natchez St.

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DON'T LOSE SIGHT OF THE FACT

That the money saving power wagon must run on successful, otherwise spelled

GOODRICH

solid rubber tires. Careful conservative buyers such as the big express companies find that facts and figures verify the superior claim made for

Goodrich Solid Rubber Side-Wire Tires

THE B. F. GOODRICH COMPANY
AKRON, OHIO

Chicago, 24 E. Lake St. Philadelphia, 1332 Arch St. Boston, 161 Columbus Ave. Detroit, 266 Jefferson Ave. St. Louis, 3926-28 Olive St. Denver, 1422 Court Place. Cleveland, 2188 9th St., S. E. Paris, 2 Rue Brunel, Ave. de la Grande Armee. London, 7 Snow Hill. Our products are also handled in New York, 66-68 Reade St., Buffalo, 731 Main St., and by The B. F. Goodrich Company of New York, and in San Francisco, 50-60 Fremont St. Los Angeles, 818 S. Broadway. Seattle, 310 First Ave., S.

THE "AMERICAN" MOTOR TRUCK

This 5-Ton "American" Truck has been in Service in Buffalo for almost two years.

THERE are two ways of building a motor truck. One is to assemble the elements which others produce, buying an engine here, axles some place else, and the transmission, steering gear and other parts wherever they can be picked up. This assembly-manufacture has one great advantage. It avoids permanent investment in plant and buildings. *Its defect is this*—the elements don't harmonize.

Our method of building is different. We make all the principal parts. *This insures uniformity of design.* Commercial motor vehicles which possess this virtue are to be depended upon for economy of performance.

¶ We make 3 and 5 ton models. Soon we will be ready with lighter load machines for freight and passenger service.

Service records are available for those who wish to know how economical "AMERICAN TRUCKS" really are.

THE AMERICAN MOTOR TRUCK CO., LOCKPORT, N. Y.

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

No. 49 **DECEMBER, 1908** **No. 49**

PUBLISHED THE FIRST OF EVERY MONTH BY

THE POWER WAGON PUBLISHING CO.

SUBSCRIPTION RATES:

One Year (Domestic)	$2.00
One Year (Foreign)	3.00
Single Copies	.20

PUBLICATION OFFICES:
THE METROPOLITAN BLOCK
Chicago, Illinois.

Advertising Rates on Application

WALTER WARDROP, Editor

Entered as Second-Class Matter December 2, 1907, at the Postoffice at Chicago, Ill., Under the Act of Congress on March 3, 1879.

Misrepresenting Costs of Operation

Agents protest against a practice supported by ignorant amateur and semi-professional accountants

MOTOR road transport has more to fear from its foolish friends, real and pretended, than from its most implacable enemies. The latter can be subdued by the mass of reliable evidence which is constantly accumulating as proof of the machine's superiority, but the former are so excited and pleased over the economy of the vehicles that they cannot perceive the harm of exaggerating it.

Every time a grossly inaccurate statement is publicly circulated with the object of advantaging the motor wagon the harder becomes the task of steadying general opinion and establishing the truth concerning the machine's economy. But when to the intemperate utterances of the novice is added the raw "capping" of the half-baked professional posing as a molder of public opinion, the situation becomes genuinely tragic. It is from the "co-operation" of this last mentioned individual that all who hope for the quick development of the industry most devoutly pray to be delivered.

* * *

One would think that almost any member of the staff of a journal professing to help the general cause of motor road transportation would not experience much difficulty in distinguishing between net and gross profit. He would hardly suspect that a mind, presumably well trained, would fall into the error of overlooking such important items of accounting as interest on investment, depreciation, wages, maintenance and repairs in estimating the machine's superiority. Such optimism, however, is often basely betrayed.

Here is a table the purpose of which is to prove how much more economical it is to collect and deliver farm produce by means of motor wagons than by vehicles which operate on fixed lines of travel like trolley cars. It is undoubtedly from the pen of the able author who a few years ago undertook to show by assembling the bare expense of operating a touring car that it was possible upon all occasions to travel from New York to Philadelphia at less cost by using such a vehicle than by taking passage in a rail car. The derision with which this foolish statement was greeted has not since stopped echoing throughout the automobile industry.

Distance traveled, 716 miles.

Amount hauled—	Cost of hauling at freight rates.	
310 empty coops	$ 15.81	
84 empty cases	1.14	
5 butter tubs	.25	
34,941 pounds poultry	118.96	
222 cases eggs	15.30	
1,406 pounds butter	1.82	
10,006 pounds miscellaneous articles, such as rags, rubber, empty barrels.	13.00	
Total		$166.28
Expense of operating truck—		
145 gallons of gasoline	$ 15.90	
30 gallons oil	9.30	
2 spark plugs	1.70	
2 batteries recharged	1.00	
		27.90
Net profit		$138.38

Blunders of this character are detected with astonishing frequency in journals which dish up information to the

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owners of touring cars. They are only to be accounted for by assuming that the boasted expertness of the authors is spurious. No journal which does not devote all of its attention to motor merchandise transport can expect to gain reputation for the accuracy of its opinions upon so difficult a subject. The cobbler sticks to his last. The thought and the associations of the staff of an automobile paper which caters to a clientele interested only in the pastime of motoring can hardly be expected to take the trouble to be well informed concerning the costs or the accounting of motor wagon haulage.

The train rates quoted for the hauling of farm produce are undoubtedly based upon the total cost of operation. The expense of operating the motor truck in competition with such train service obviously only includes the mere cost of fuel, ignition and grease. If to the sum of these items there was added the outlay for drivers' wages, repairs, depreciation, interest on investment and fixed stable and administrative charges, it is likely that the "net profit" would, as the chemists say, sublime and disappear without a residue. In fact of real profit there would scarcely be even so much as a trace. To be sure, it is quite conceivable that the flexibility of the motor wagon, which permits deviation from a fixed line of travel for the accommodation of shippers, may afford such special advantages as to make its service very desirable. These advantages, however, should be presented without undue exaggeration.

In any argument involving money matters it is of the utmost importance to exercise extreme care in order that misrepresentation shall not occur nor be detected. It is fatal to wilfully misrepresent or maliciously conceal factors which are decisive in determining the issue. Agents selling motor wagons find their business peculiarly sensitive to misrepresentation of this character. They do not appreciate the humor of confounding net and gross profit, or of establishing either by means of the fake methods which prevail among a certain class of motor wagon transportation accountants. The ridicule which foolish exaggeration inspires falls largely upon them. They are kept busy excusing follies for which they are not in the least responsible. One of them, doing business in Omaha, sends the following protest to this journal:

After the business houses of Omaha get a certain amount of education with respect to the uses and economy of motor wagons this is going to be an exceptionally good field for the sale of such machines. It is very annoying, however, to have automobile periodicals, that are published for those who own touring cars, print an occasional column or so of balderdash relating to the work performance of the business machine. Apparently the publishers of such journals print whatever contributions are received without giving a second thought to the accuracy of the statements made.

In a recent issue of one of these journals the bare operating cost of motor wagons engaged in hauling farm produce was compared with the total cost of hauling the same merchandise by rail cars. The balance struck in favor of the road machines was, of course, fictitious. The author of this article has entirely overlooked the cost of tire repairs, drivers' wages, maintenance, depreciation and interest on capital invested. If these items were included in the cost of the motor wagon transportation I estimate that the expense of the service would be greater than the cost of rail freighting. It is quite possible, however, that despite this disadvantage the use of motor wagons is well justified. The firm employing them undoubtedly is getting better and quicker service, and is eliminating drayage charges at both ends of the route.

I believe that the better class of business houses will be more quickly persuaded to use motor wagons if no attempt is made at false accounting.

A number of concerns here are studying the economy of motor wagon haulage. They are endeavoring to procure all the information which is available concerning the work of the machine. Nearly all of them read the "Power Wagon."

IN A CLASS BY ITSELF.

ONE of the influential dailies published in Baltimore asserts that the motor police wagon in commission there is neither so economical or efficient as the horse-drawn vehicle which it has superseded. As no comparison of the two forms of service is furnished the statement amounts to condemnation without proof. If investigation really shows that the Baltimore machine is inferior in all important particulars to the vehicle it has replaced, it should be discarded. But before this is done it will be well to make sure of the competency of the investigators. Amateur accountants are always to be considered unreliable.

As there are hundreds of cities throughout the country which employ motor police wagons—the experience of some of them with such machines dates back to 1903—it is easy to ascertain what is the general state of official opinion concerning their usefulness and economy. So far as it is possible to discover Baltimore is the only municipality which has lodged a protest against their employment. From this it is competent to conclude that the opinion prevalent in Baltimore is founded upon prejudice.

The economy of the motor police wagon is so well known in Chicago that the municipal authorities have authorized the construction of ten such vehicles. In Philadelphia, as is recorded elsewhere in this paper, its advantages are so apparent that an appropriation of $50,000 has been recommended for the purchase of ten more. Cleveland's chief of police is in despair because he cannot have as many of them as he wants.

It is pretty well established that, mileage and service considered, the motor police patrol wagon, when properly cared for, is much more economical and efficient than the horse-drawn vehicle intended for like service. If the Baltimore police department is unable to obtain this economy and efficiency there is evidently cause for ridding the service of those who are responsible for such unfortunate results. Every enlightened economist holds the opinion that it is merely a matter of time and the availability of public funds until the horse is entirely eliminated from the fire and police services.

In a motor delivery wagon recently built the rear doors of the body were replaced by a shutter.

Motor bus service is being furnished between Lake View, Ore., and Likely, Calif. The latter point is the terminus of a railroad.

Motor buses are being operated between Glamis and Blythe, Calif.

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Receiver for Electric Bus Line

Low fare charged fails to provide sufficient revenue for the Philadelphia service

ACTING upon the application of a creditor storage battery concern the courts have appointed a receiver for the Auto Transit Company, which has been operating electric buses in Philadelphia for the past sixteen months and now has forty-five machines in commission.

From the beginning the company's expenses have exceeded its receipts. The fare has been too low. It should have been ten cents instead of five. The effort to increase revenue, by creating zones of travel within which nickel fares would apply, came too late to retrieve the losses already made. Furthermore, the company's fixed expenses were maintained upon a basis of an installation of fifty buses. Operating expense, therefore, was unexpectedly high for the long period that the company only had half that number of machines in service.

It would be unfair to infer that the operating expense was extravagant. On the contrary, it was comparatively low, considerably less in fact than that of any other bus service of which there are reliable records extant. For the first nine and one-half months it has averaged 20.9 cents per vehicle mile, in which estimate is included the expense of battery and tires, motormen, guards, current, repairs, interest, insurance, depreciation and all other fixed charges. Considering the vehicle mile cost of the largest motor bus installation, the figure just quoted represents genuine economy in administration. Abroad, where operating costs are slightly lower than they are in this country, the best motor bus service record of which we have any knowledge shows the vehicle mile cost to be 23.874 cents.

* * *

The great fault of nearly all enterprises of this character has been the unconquerable desire of their promoters to compete on even terms, so far as fare is concerned, with the operators of rail transportation lines. Until dearly bought experience established the hazard of doing so, motor bus companies have acted upon the theory that an increase in the fare could neither be excused nor obtained. Apparently they did not think it worth while to consider that motor bus service is supplementary and not competitive, and, therefore, the charge for such service should be determined wholly by the cost of operation. It has taken almost three years for the investors who have so many million dollars tied up in London motor bus enterprises to realize how important it is to ignore the so-called competition of the railways. The operators of New York's motor bus service make no attempt to compete with the paralleling surface and elevated lines. The fare on their machines is ten cents. The truth of the matter is that few use the motor bus except those who are compelled to do so. This fact of itself should indicate that it is not necessary to cheapen the service. Even in London, where almost 1,200 machines are used and about 200,000,000 passengers are annually carried it is not evident that they compete with the fixed lines of travel. They have created their own traffic.

Financially considered the situation of the Auto Transit Company is not so embarrassing as to prohibit the continuance of its service. The sum of its indebtedness is only $80,000. Its assets, which include real estate, garage and forty-five machines, have a book value of about $380,000. It is scarcely necessary to say that the actual value of the assets would be much lower if sold under the hammer. Potentially the earning power of the machines is high if the proper operating conditions can be devised.

* * *

The company was organized in 1906 to operate public service motor vehicles on certain Philadelphia streets wherein the use of rail cars was prohibited. The machines pass all of the principal buildings of the downtown district and serve a densely populated portion of the city. The promoters of the enterprise concluded that as this section was already fairly well served by street cars at a five-cent fare, the good opinion of the public could be won by offering six tickets for a quarter. The traffic of the machines has proved that this concession was as needless as it was disastrous.

The buses of the Auto Transit Company are of the double deck type, seating sixteen passengers inside and eighteen on the outside. They weigh 11,400 pounds apiece without passengers and are equipped with four-inch dual tires on each wheel. The cost of tire maintenance has been high chiefly owing to the existence of a rough stretch of paving in the vicinity of the city hall. The machines have been averaging about 120 miles a day. A very thorough description of this service and its equipment appeared in the July issue of the POWER WAGON.

* * *

Receivership proceedings were hastened by the action of the city authorities in threatening to stop the service of the company's machines unless the sum of $9,000, overdue for vehicle licenses and paving, was paid. The municipality claimed that the company owed it $2,500 for licenses and $6,500 for paving streets traversed by the machines. The company asserted the paving charge was too high. It seems that the company, in accepting its franchise, bound itself to pay two cents per square yard for paving the streets over which its machines traveled. The annual license fee for each motor bus is $100.

Tacoma, Wash., has just been supplied with a motor driven police wagon.

Motor bus service will be supplied between Dubois, Idaho, and Spring Mountain.

The Bucyrus Transportation Company has been formed in Bucyrus, Ohio, to operate 20-passenger motor buses between that point and New Washington, Tiro, Sulphur Springs, Chatfield, Lykens, Lemert, Benton, Oceola, Wyandotte, Monnett, New Winchester, Caledonia, North Robinson and Leesburg.

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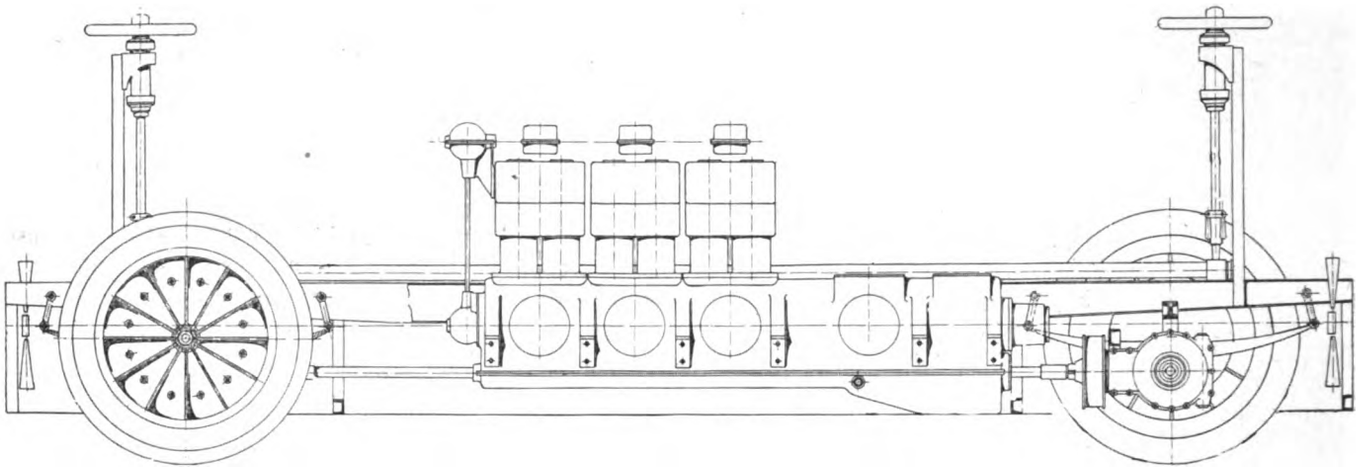

Military Motor Vehicle Design, Showing Engine Placed Centrally and Fitted With Double Steering Apparatus.

What An Armored Car Should Be Like

Description of a machine in which the orthodox features of design are conspicuously absent

WHILE civilized mations are at peace there is small prospect of developing a type of armored motor car in which the principles of design will have much permanency. Military experts cannot entertain any fixed opinions concerning the scope or character of such a machine so long as opportunity is denied for making practical test of it. In the meantime there is considerable speculation concerning the form it should assume if the conditions attending its operations are not of an unusual character.

It is not very difficult to imagine the circumstances under which an armored car of orthodox automobile design, fitted with machine guns, might operate in countries which are provided with normally good roads. Suppose such a machine had to use a road along which large bodies of troops were passing at the same time. It would try to get past the marching columns as quickly as possible. But unexpected obstacles might be presented. A bridge might have been blown up, or complete congestion might occur on account of some collision which had entirely blocked the road. In such a situation the motor car would either have to quit the road and take to the fields, or, if this proved impossible on account of steep inclines or forests on both sides, go back a considerable distance to the nearest cross-road. To secure space for turning would be difficult, while to drive backward along the marching column would be troublesome and take a lot of time.

Or, suppose an armored automobile was attached to the vanguard. In preceding the column it might get in touch with the enemy, be attacked with rifle fire, and be compelled to retreat. This would require quick turning. For a time it would be exposed to great danger. This moment of peril would be prolonged if the narrowness of the road should make it necessary to drive repeatedly from one side to the other. Under such circumstances the least disorder in the mechanism of the car might prove fatal, for one of its occupants would surely have to step out in order to remedy the difficulty.

It must also be taken into consideration that, with a car of present day orthodox design, the motor is most exposed to fire from the enemy. Furthermore the necessary armor plating will make the motor all the more difficult of access. Then think of an armored car following in pursuit of a balloon. Such service would make heavy demand on the ability of the vehicle to make its way across open country.

Considering these and other easily conjectured conditions of service it would appear that the vehicle should possess the following qualifications:

1. Especial ability to move across the open country, where there are no roads.

2. Great mobility, driving forward and backward without turning.

3. Motor located where it will be effectively protected and easy of access.

* * *

The first demand will best be met by driving all four wheels. In order to comply with the second all four wheels must be steered. To satisfy the third condition the motor must be placed centrally in the car and be accessible from all sides. Then the armor plating can encompass the entire structure. The weight of the vehicle will be distributed equally on the four wheels—a circumstance of greatest moment for travel on soft ground. The center of gravity will be almost exactly in the middle of the car, and the danger of skidding will be reduced to a minimum.

The accompanying illustrations give an idea of the proposed construction. As armament two machine guns placed next to each driver's seat are selected. The steering is electrical. For the armored automobile this is recommended, as the current generated on board may advantageously be used also for signaling and lighting. Mechanical drive for steering wheels is used. That it has not been more generally adopted must be ascribed solely to the fact that there has existed no urgent need for it. It may be stated that the mechanical drive will work more ad-

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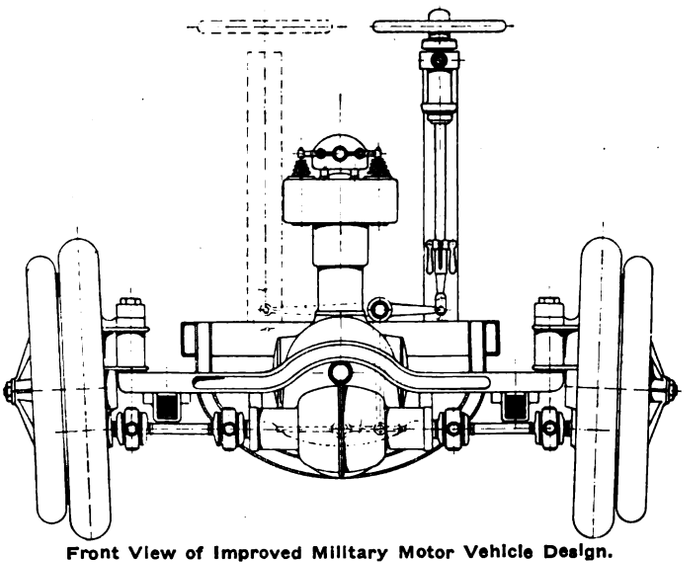
vantageously if all four wheels of the vehicle are converted into steering wheels. The wheels are provided with two tires, one pneumatic and the other, a small one, of solid rubber. This solid tire will enable the car to get out of range of the enemy's fire in case the pneumatics should suffer harm. It will also prevent the wheels from sinking too deep in soft ground. Under normal conditions it will not touch the ground at all.

The link shafts of each pair of wheels are connected by differential gearings. These are operated by two shafts arranged longitudinally, by means of conical wheels, which also are connected by a main differential gearing placed in the change gear. The conical gear is an uncommon one in so far as it has a double set of wheels. These are mounted on ball bearings and may be connected singly with the differential gear casing by means of three coupling bolts arranged on movable rings. This arrangement has been made to allow of changing the direction of travel by placing in commission either one or the other conical wheel, one of which will always run idle. The main differential gear distributes the drive draft equally over both pairs of wheels.

The change gear has three degrees of speed, the highest of which will give the car a velocity of from 25 to 35 miles an hour. Its general construction enables the driver to handle it with ease from the seat at either end of the car.

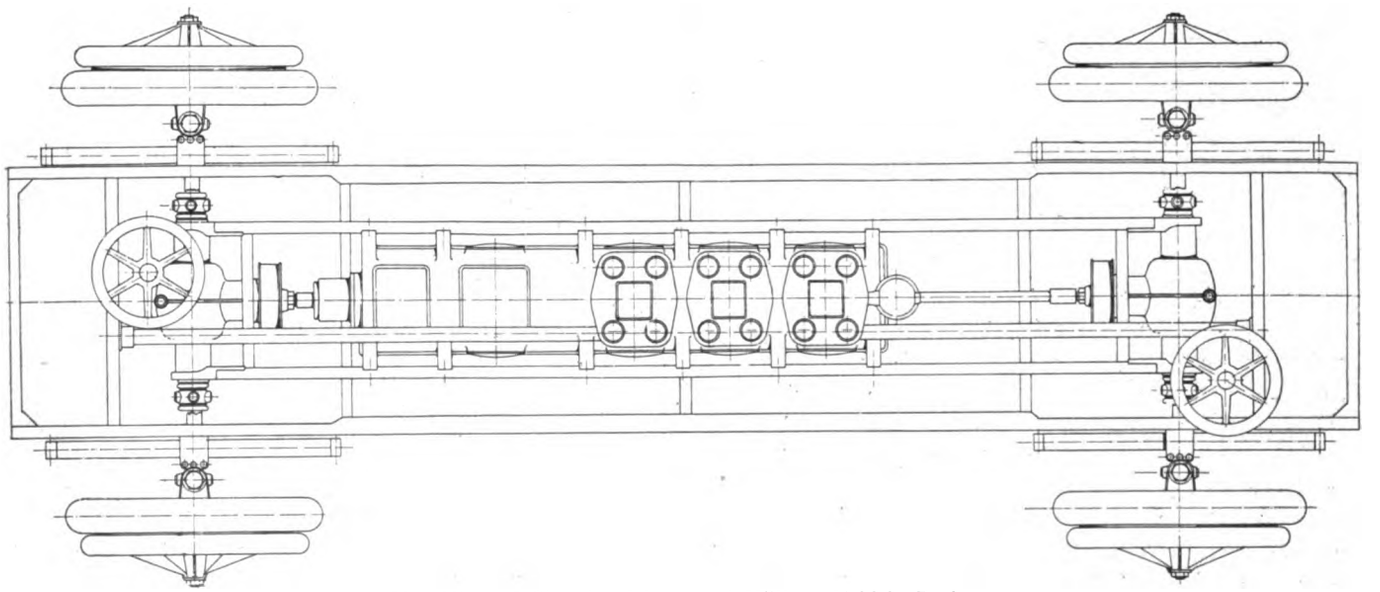
In order to place the car's center of gravity as low as possible the drive shaft has been placed midway between the axes and lower than these. The motor shaft has been brought as near to it as circumstances would allow. The diameter of the fly wheel and coupling had to be reduced accordingly. For this reason a six-cylinder motor had to be used. The clutch is of double cone construction and runs in oil. By the pressure of the lever first one and then the other cone is brought into play, or is thrown out of action.

The motor is provided with valves regulated from above, and therefore easy of access. It is deemed advisable to have three separate carbureters, one for each pair of cylinders. Thus it will be possible to attend to any disorder in one of them while the motor continues at work with two-thirds of its capacity. The motor, together with the change gear, is housed in a casing mounted on the same frame with the two differential gearings. Cooling of the motor is effected by air. The air supply is furnished by two ventilators arranged at the ends of the car and extensions of the motor shaft. According to the direction of travel either one or the other ventilator is coupled to the motor, while the other is locked. The outside openings of the ventilators must, of course, be protected against rifle fire. In order to make it possible to bring the car out of the enemy's reach, even in case the air cooling apparatus should be damaged, it is advisable to provide a reverse valve in the pressure pipe of the pump and a reserve water tank above the motor. If the water in the reserve tank is brought to the boiling point, the motor, though its capacity be reduced, can be kept running for some time while it is being cooled by steam.



Front View of Improved Military Motor Vehicle Design.

The total weight of an armored car of this description, machine guns and two operators included, should not exceed 3½ tons, while the capacity of the motor would have to amount to about 60 h. p.



Plan View of Chassis of Improved Military Vehicle Design.

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Lack of Uniformity in Cab Fares

Though operating costs do not greatly vary in any country service rates differ most surprisingly

THE difference in the cost of operating is not sufficient to explain why the patrons of motor cabs in this country should be charged from 200 to 300 per cent more than the same service can be procured for in Europe or Great Britain.

With us the motor cab charge is fixed in an arbitrary manner by operating companies. Abroad the fare is determined by municipal authority. For the service of the motor cabs which are most popular in Paris one or two passengers may ride for the first three-quarters of a mile for 14 cents, while for every succeeding quarter of a mile a charge of two cents is made. Three or four passengers can hire the service of one of these machines for two-thirds of a mile at a cost of 14 cents and two cents for every succeeding sixth of a mile. The gross earnings of these machines varies between $7.50 and $8.50 a day, of which the driver receives 27½ per cent, out of which he is expected to purchase fuel, the operating company providing half a gallon of lubricating oil per day per machine. Another of the French cab services has a day tariff of 16 cents for the first half mile and 4 cents for every additional third of a mile. Its night tariff is 36 cents for the first half mile. The drivers of this company take in a little more money than the drivers of the service just considered. They hire their vehicles from the owning company, paying about $5.76 per day for the use of the machine.

There are as many tariffs for motor cab service in Paris as there are operating companies. This is accounted for by the fact that the municipal authorities have not deemed it wise to prescribe fixed charges while the industry is in the first stages of development. A maximum charge is established by law. It is very much higher than prevails in any one service.

* * *

All things considered, it would appear that the French method of regulating motor cab fares is more businesslike than ours. Operating cost should be the basis upon which fares are calculated. As this cost is by no means uniform the element of competition is given free play and the public gets the benefit therefrom. A fixed warranted protection for inferior cab design and unscientific administration. It denies a reward for excellence in engineering.

In London the motor cab tariff is 16 cents per mile, or a like amount for ten minutes of service. This charge does not include the carrying of baggage which has to be placed upon the top of the vehicle. The baggage charge is 4 cents per package. If the speed of the vehicles falls below 6 miles per hour charge is made on the time basis.

It is not known or suspected that the physical conditions under which motor cabs operate in America are any more destructive or difficult than those which prevail in European or British cities. Here the prevailing tariff is 30 cents for the first half mile and 10 cents for each succeeding quarter. Investigation does not show that the expense of maintenance is any greater here than abroad, yet the cost of our service is twice as high as the foreign service.

* * *

It is all very well to talk about protection of investment, but it must not be forgotten that the service of motor cabs comes within the sphere of things usually considered as public utilities. For the right to use the streets for profit the public is entitled to the cheapest and best service it is possible to provide. The opinion is prevalent that motor cab charges are extortionate. This opinion will exist until the whole subject of motor cab operation is intelligently studied by our municipal authorities and a tariff devised which will work no injustice to any operating company's investment. Superior service should command a superior price. Inferior service should be charged for accordingly. But it is absurd to place good and bad service upon a common footing so far as public cost is concerned.

BIG SUM FOR MOTOR POLICE WAGONS.

PHILADELPHIA'S director of public safety has recommended the outlay of $50,000 for motor police wagons. In urging the appropriation he declared that horses are unable to furnish the prompt service which is required of them. This is owing to the rapid development of the city. A new system of police wagon service is demanded. The sum asked will provide ten machines. Next year the expenditure of a like sum will be required and demanded.

WITH THE GLIDDEN TOUR BAGGAGE WAGON.

ALL the heavy baggage of those who participated in the last Glidden tour was transported by a Rapid motor wagon, which was expected to make each control within the time allotted for the competing touring cars. The performance of the machine in this respect is the theme of a little book recently issued by the Rapid Motor Vehicle Company. The story is picturesquely and entertainingly told.

Mischievous boys are causing considerable loss to London motor cab drivers by pulling down the red flag of the taximeter when the operators are not looking.

The South Bend (Ind.) Taxicab Company has been organized. It is expected that the first of its vehicles will be seen on the streets by the middle of the present month.

The mayor of Riverside, Cal., is touring the country and inspecting plants which are producing motor driven fire apparatus. He is greatly impressed with the superior economy and efficiency of such machines.

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Street Surfaces of the Future

Present day paving materials to be superseded by a durable and economical rubber compound

ALL who give more than passing thought to the economy of commercial motor vehicles, but more especially those who are sanguine of soon seeing the machines predominate in city haulage, are greatly interested in the nature of the material with which streets are paved.

The relationship which exists between the street surface and the work performance of any vehicle is so intimate, and of such importance, that it is ridiculous to consider these two factors in the economy of transportation apart. As a commentator observed in the last issue of this journal, the roadway and the vehicle, whatever the nature of the latter may be, really form one unit, and if either of the components is inferior the efficiency of the whole is seriously impaired.

* * *

The tractive value of the horse is noticeably affected by the condition of the street surface. A smooth and hard material, which greatly aids vehicle motion, and is beneficial in such an important matter as public sanitation, affords such insecure footing for draft animals that all its advantages are neutralized. A rough surface, such as granite blocks present, increases the tractive effort, is insanitary, noisy and uneconomical in every particular except maintenance. The constituent elements of horse transportation, firm footing for the animals and free motion for the vehicle, are so oddly combined that every effort to provide accommodation for the one has up to date resulted in an unsuitable condition for the other. Inherently, therefore, haulage by horses is unscientific. The physical conditions which fit its "motive power" are grossly unsuited for the passage of its loads. It is a badly mixed situation which grows more burdensome as this class of traffic increases.

* * *

No one will deny that wood, stone and asphalt, the three principal surfacing materials, are the most convenient substances at hand for street paving. The use of two of them is so ancient that men have almost lost the power to speculate upon a substitute. Wood and stone are so abundant, and so universally employed in the construction of streets, that it almost savors of impiety to suggest that they be discarded. Yet this very thing is seriously proposed. Even asphalt, which scientifically considered is superior to both, is no longer to be tolerated. It is inelastic and therefore destructive of the life of the horse. In icy winter weather its smoothness is obviously disadvantageous. And so, with none of the paving materials so commonly used acceptable for the purpose to which they are put, the world is asked to consider the merits of rubber as a substitute. Its advocates assert that it is moderately resilient, silent, sanitary, durable and comparatively inexpensive. They claim it will act as a cushion for the horse's feet, prolong his useful life, and if properly compounded will be quite as economical for motor traffic as the best of the paving materials now in use.

One of the problems of rubber manufacture is to devise new means for utilizing reclaimed scrap material. Several times of late it has been suggested that the construction of rubber surfaced streets would consume a large quantity of this product. The idea has been growing until to-day it has assumed the proportions of a fixed intention. At a recent congress of the allied rubber interests one of the principal speakers made this prophecy:

"I have little doubt that in the course of a very few years the principal streets of the most important cities in the world will be paved with rubber. This material as a road covering has very many advantages over the present wood or asphalt covering. It is much more durable and sanitary; noise is reduced to a minimum, and mud to the vanishing point. It is but a question of price which hinders the general adoption of rubber paving in our great cities. If a good rubber paving could be produced to-day at, say $10 per square yard, as against $3, the present price of the best other materials—and I see no reason why this cannot be done—then in view of the much longer life of rubber as against wood or asphalt, which is about six to one, I am of opinion that this branch of industry should be at once opened out."

OPERATING MOTOR CABS ON CONTRACT.

ENTERPRISING promoters are still busy forming new motor cab companies in London. The Reliance Taxicab Company is the latest to be chartered for business. Its capital stock is $1,000,000. It is to operate French machines. Its officers do not expect that the individual machine earnings will be higher than $7.80 a day.

Maintenance, repairing, insurance and housing will be made the concern of a contracting company which undertakes all work of this character at a fixed daily charge of $3.96 per vehicle. A day's service in this case is reckoned at twelve hours. At the end of five years the contracting company agrees to deliver the machines to the operating or owning company in good running condition. There is unusual significance in this pledge. It indicates the certainty with which experts can calculate fixed charges pertaining to industrial motor vehicle maintenance, especially when large numbers of such machines are employed. The readiness of the contracting company to deliver the machines in its care at the end of five years in good working condition is also clear evidence that the charge which is usually made for depreciation is, in the majority of instances, exaggerated in order to cover inexperience in the administration of commercial motor vehicles.

Another London operating company, finding that a greater volume of business awaited its machines than could be conveniently cared for, has increased its capital stock by $1,375,000 for the purchase of 750 more cabs.

The trustees of South Pasadena, Calif., have recommended the purchase of a motor driven chemical engine.

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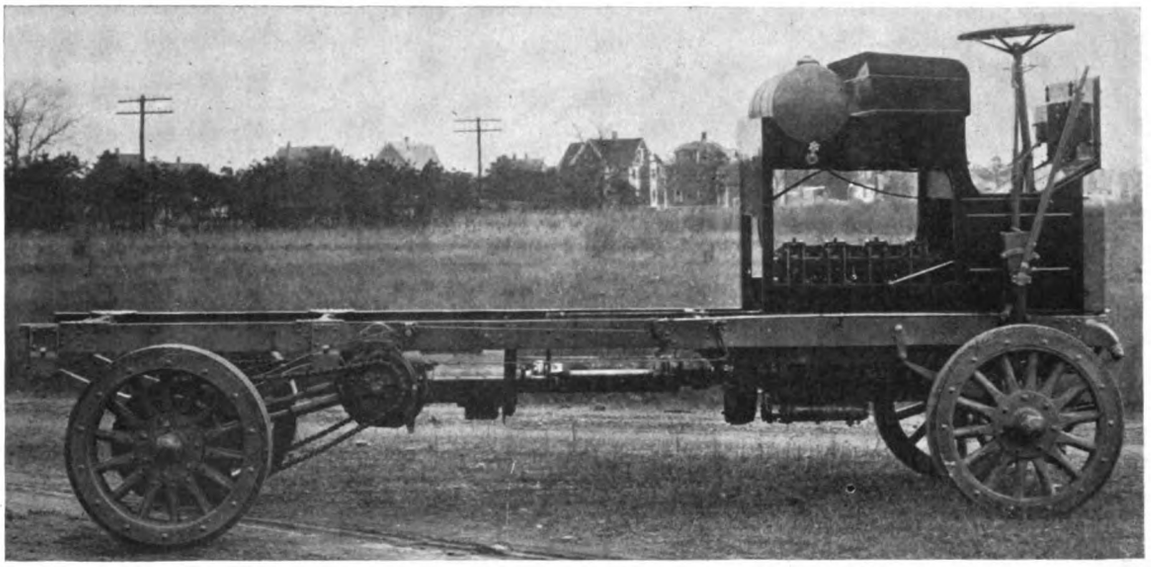


Knox Company's Five-Ton Wagon Fitted with 50-hp. Water-Cooled Engine.

Useful Information for Investors

The principal factors in administration are discussed in the Knox Company's new catalogue

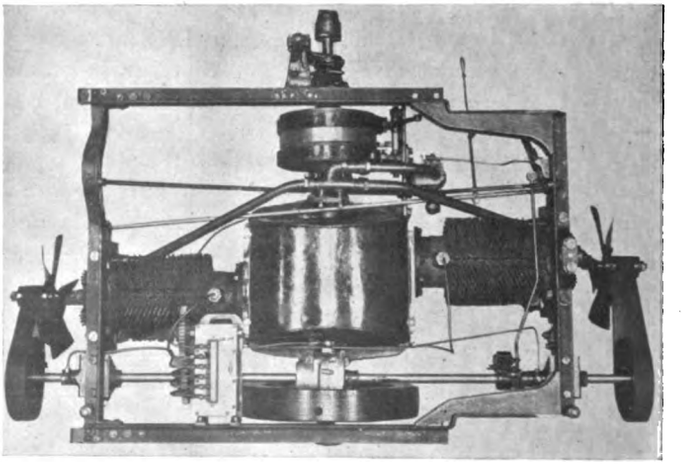
METHODS of administration are the decisive factors in power wagon operation. This statement is elaborately confirmed in the catalogue just issued by the Knox Automobile Company, of Springfield, Mass. In the prefatory pages of the book many useful suggestions are given to prospective investors.

The executive ability which has been required in developing horse transportation to its present state of usefulness must be duplicated by those who desire to take full advantage of the superior economy of motor wagon transportation. Motor wagon haulage is a science; at least it is so understood by those who are most familiar with its advantages. It is only the inexperienced who consider it an experiment and fail to apply precise methods for its control. It is so obvious that the motor wagon is a machine that it seems superfluous to say that machinelike administration only will call out its highest economy.

The Knox catalogue very justly compares the whole of the motor wagon with the horse, which is the motor of its outfit, all the rest being hardware. The company urges buyers to expend that care upon the machine which in the past they have been accustomed to give their horses. This advice might very profitably be heeded by others than those who are professedly inexperienced in the use of motor vehicles. Every dollar's worth of time spent in the care of a motor wagon, providing the labor is intelligently employed, will greatly benefit the transportation service, to say nothing about prolonging the life of the machine and so reducing the yearly charge for depreciation. A sick horse is still capable of performing work. The animal's efficiency, however, is measured by its normal health. Sick and deranged motor wagons also have capacity for pulling loads, but they do so at unnecessary expense.

The responsibility of owners of power wagon installations is clearly and concisely pointed out in the catalogue, special emphasis being laid upon the importance of the function exercised by the man in charge of the equipment. Success or failure is in nearly every case to be charged to the competency or incompetency of the stable management. The evil habits of overloading and overworking are severely reprehended. As work is the chief cause for deterioration in any machine it is of great importance that motor wagons should be regularly withdrawn from service to permit thorough inspection and repairs. In this connection it is highly interesting to know, from the experience of the Knox company, that the most successful operators of commercial motor vehicles are the firms which place entire reliance upon the ability of the men in their employ to undertake all repairs. The haphazard methods of privately owned repair shops are not to be compared with the system which commercial houses can establish if they have a sufficient number of motor wagons to look after.

For the coming season the Knox company is making seven models for the hauling of merchandise. The machine with lowest capacity is rated to carry 1,500 pounds.



Air-Cooled 20-hp. Engine Installed in Knox 3,000-Pound Model.

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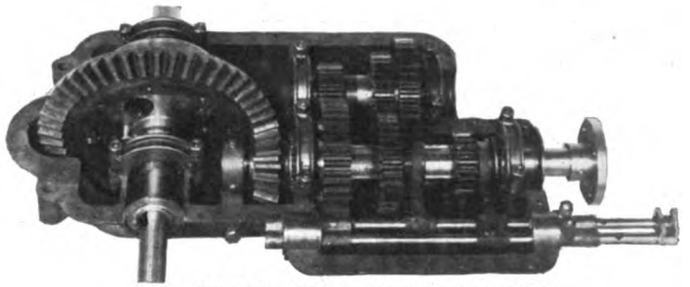
The rating of the largest truck is five tons. Between these two extremes there are models rated at 2,500 pounds, 3,000 pounds, 4,000 pounds, 6,000 pounds and 8,000 pounds carrying capacity. Following are some of the principal features of design and construction of the various models:

Five Ton Truck—Maximum road speed, 12 miles per hour; wheel base, 154 inches; tread, 67 inches; tires, 36 by 5 inches in front and 36 by 4 inches (dual) in the rear; engine, 50 hp.; weight of chassis, 5,600 pounds.

Four Ton Truck—Maximum road speed, 12 miles per hour; wheel base, 154 inches; tread, 67 inches; tires, 36 by 4 inches in front and 36 by 4 inches (twins) in the rear; engine, 50 hp. weight of chassis, 5,400 pounds.



Knox Selective Sliding Gear Transmission.

Three Ton Model—Maximum road speed, 15 miles per hour; wheel base, 149 inches; tread, 67 inches; tires, 36 by 4 inches in front and 36 by 3½ inches (twins) in the rear; engine, 40 hp.; weight of chassis, 5,100 pounds.

Two Ton Model—Maximum road speed, 30 miles per hour; wheel base, 125 inches; tread, 60¾ inches; tires, 34 by 4 inches in front and 34 by 5 inches in the rear; engine, 40 hp.; weight of chassis, 4,200 pounds.

One and One-Half Ton Model—Maximum road speed, 15 miles per hour; wheel base, 100 inches; tread, 56 inches; tires, 34 by 3½ inches in front and 34 by 4 inches in the rear; engine, 20 hp.; weight of chassis, 3,260 pounds.

Two Thousand Five Hundred Pound Model—Maximum road speed, 20 miles per hour; wheel base, 97 inches; tread, 56 inches; tires, 32 by 3½ inches front and rear; engine, 20 hp.; weight of chassis, 2,100 pounds.

One Thousand Five Hundred Pound Model—Maximum road speed, 15 miles per hour; wheel base, 85 inches; tread, 56 inches; tires, 32 by 3 inches front and rear; engine, 8 hp.; weight of chassis, 1,800 pounds.

MOTOR BUSES IN PLACE OF TROLLEY CARS.

BY THE middle of this month the first batch of motor buses intended to serve in lieu of trolley cars in Huntington, Ind., will be commissioned for service. Five 16-passenger machines will be operating by that time. The vehicles will be fitted with a rear platform and in many respects will resemble the ordinary trolley car. The vehicles will be electrically lighted and provided with two side entrances. The seats will be upholstered. Unusual care will be taken to provide thorough ventilation. The engines of these buses develop 35 h. p.

Light motor wagons are being used in the postal collection service of Lynn, Mass.

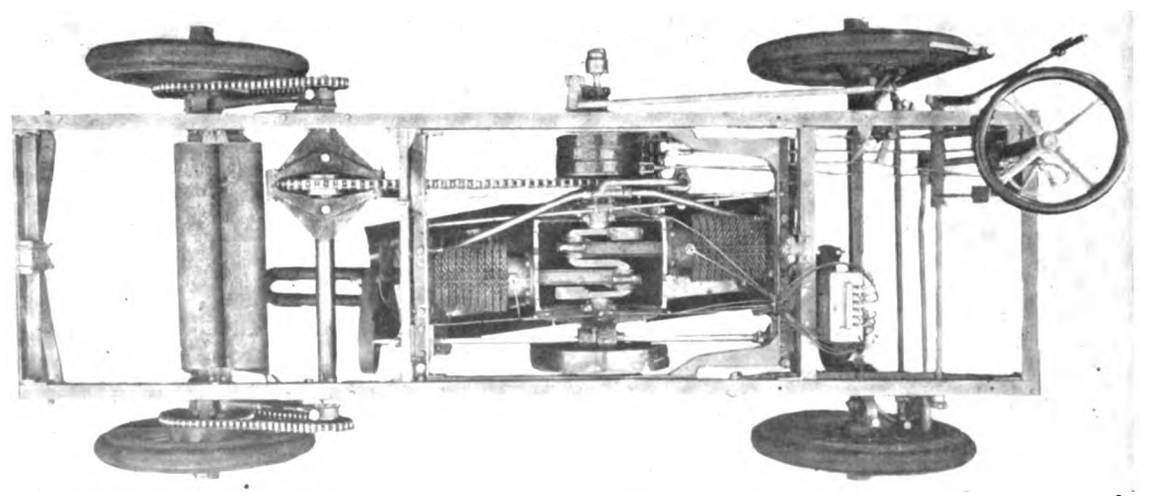
A motor hose and chemical wagon has been supplied to the fire department of Thompsonville, Conn.

Enough motor vehicles are now employed in municipal service in Milwaukee to justify the erection of a centrally located garage.

Trial is now being made to ascertain if it is feasible to operate motor fruit carrying wagons between Denver and Greelev. The roadway is not especially good

An electric bus and an electric baggage wagon are to be operated in Oswego, N. Y., for the convenience of the Western New York & Pennsylvania Traction Company's patrons.

Fire recently destroyed $250,000 worth of property in Fond du Lac, Wis., and as the inadequacy of the horse drawn fire department apparatus was demonstrated upon that occasion the city council is now considering the purchase of motor driven apparatus.



Chassis of Knox Two-Cylinder 20-hp., 3,000-Pound Model.

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Economical Livery Service

Records of operating expense for machines employed in hauling baggage and passengers

TWO motor buses and a motor wagon are used in the service of the Indiana Springs Company in transporting passengers and their baggage from the railroad station at Attica to the Mudlavia health resort, five miles away.

The service of the machines effects a saving of about $250 a month. The average monthly cost of operating each bus is $75. Each bus frequently makes from four to eight round trips a day. The operating cost of the buses for the first six months of the present year is shown in the following tables:

JANUARY.

	Bus No. 1.	Bus No. 2.
Total cost of operation	$62.65	$57.75
Cost per day	3.48	2.51
Cost per mile	.16	.079
Cost per trip	1.46	.85
Miles per gallon gasoline	5	6

FEBRUARY.

	Bus No. 1.	Bus No. 2.
Total cost of operation	$25.23	$31.17
Cost per day	2.52	3.12
Cost per mile	.08	.118
Cost per trip	1.05	1.30
Miles per gallon gasoline	8	6

MARCH.

	Bus No. 1.	Bus No. 2.
Total cost of operation	$29.79	$43.20
Cost per day	2.97	2.27
Cost per mile	.087	.06
Cost per trip	.96	.654
Miles per gallon gasoline	6	8

APRIL.

	Bus No. 1.	Bus No. 2.
Total cost of operation	$97.51	$72.73
Cost per day	3.48	2.65
Cost per mile	.10	.10
Cost per trip	1.08	1.17
Miles per gallon gasoline	6	7

MAY.

	Bus No. 1.	Bus No. 2.
Total cost of operation	$113.39	$101.43
Cost per day	4.04	3.75
Cost per mile	.154	.115
Cost per trip	1.69	1.26
Miles per gallon gasoline	5	6

JUNE.

	Bus No. 1.	Bus No. 2.
Total cost of operation	$93.08	$89.49
Cost per day	5.17	3.31
Cost per mile	.182	.083
Cost per trip	1.03	.993
Miles per gallon gasoline	5	7

From the following table, which indicates the work performed by the three machines in June, the cost distribution can be ascertained:

	Bus No. 1.	Bus No. 2.	Truck.
Driver's salary	$40.00	$40.00	$36.00
Cost of oil	2.70	4.50	1.57
Cost of gasoline	10.78	16.06	12.10
Miscellaneous	39.60	28.93	59.85
Total cost	93.08	89.49	109.52
Gallons of oil used	6	10	3½
Gallons of gasoline used	98	146	110
Number of passengers, regular	240	487	4
Number of passengers, D. H.	32	51	17
Number of trunks	....	....	206
Number of days operated	18	27	20
Cost per day	$5.17	$3.31	$3.77
Number of miles operated	506	990	660
Cost per mile	$1.182	$ .093	$1.65

The three machines, which are Rapids, are cared for by the Kramer-Allen Motor Co., of Attica, Ind.

EFFICIENT FIRE VEHICLES.

PROPERTY fires are usually destructive in proportion as the extinguishing apparatus is slow or quick in arriving at the scene of trouble. The record of motor driven vehicles in service of this class is very conspicuous. Wherever they have been installed fire losses have been so low as to cause surprise even among those who are familiar with their remarkable superiority to horse drawn vehicles. They are the best kind of insurance it is possible for a municipality to provide.

Investigation of the service obtained from the machines employed by the Springfield, Mass., fire department will confirm this opinion. The city owns four machines, two hose and chemical wagons, operated by gasoline motors, and the others fast first-aid vehicles equipped to cope with incipient fires, and which usually reach the burning building before the heavier wagons can get into action.

In one month these vehicles have responded to 75 alarms, and as a result of their prompt arrival the loss has only been $3,000. At one fire, in a stable, the loss amounted to $1,600, leaving seventy-four fires in which the average loss did not exceed $20. This is a remarkable showing of efficiency, and it is doubtful if any city in the country can show a like result.

A company has been organized in Reading, Pa., te furnish motor cab service.

Motor bus service is being furnished between Rock Springs and Pinedale, Wyo.

It is said that the Servian government has ordered 400 automobile for use in the anticipated war with Austria.

Two hundred motor cabs are in commission in Buenos Ayres, 150 being four cylinder machines and 50 of the two cylinder type. All are of French manufacture.

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Motor Wagons for Building Trades

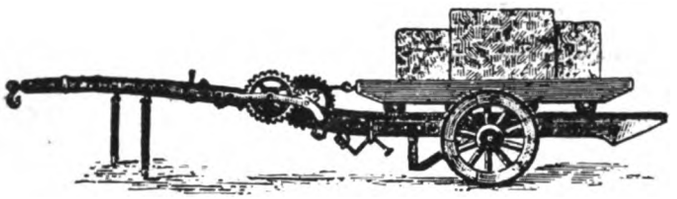
Machines for this class of service to be tested in competition against the horse drawn vehicles now used

BUILDERS and contractors have a much higher opinion of the economy of motor wagons since they have been made acquainted with the work performances of such machines in Paris.

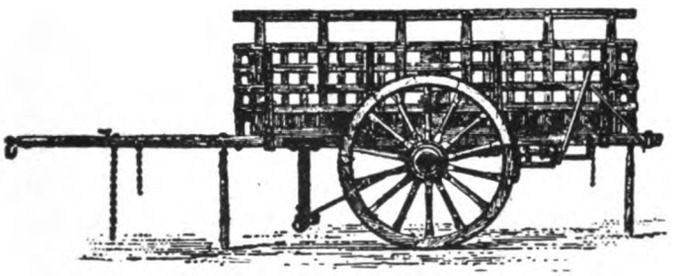
Much underground railroad construction has been going on of late in the French metropolis, necessitating the haulage of excavation material from the tunnel shafts to river barges. In this work gasoline and steam wagons have been exclusively employed. Rapidity, minimized traffic congestion and low expense have characteristically marked the service of these machines. So successful have they been that the local association of contractors and masons, desiring more information concerning their economy, has formally requested the Automobile Club of France to organize a public and competitive test between such machines and the horse-drawn vehicles so generally used in such work.

Upon pausing to consider that about 5,000,000 tons of building material is annually transported in Paris it becomes evident that the attempt to decisively establish the economy of motor wagons in such service is likely to prove historically important. That the machines will triumph in the competition is a foregone conclusion.

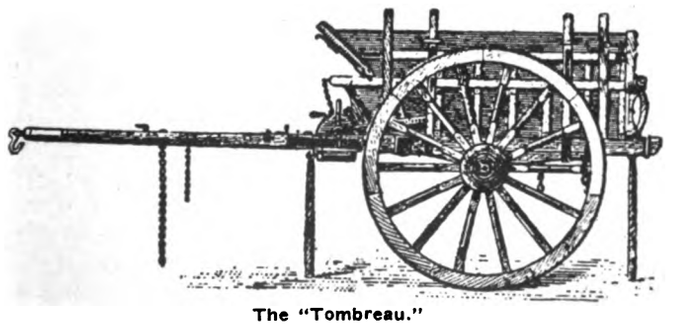
There are three types of horse-drawn vehicles commonly employed in the Parisian building trades. One is the "binard," a low built, two-wheeled float, used in hauling large blocks of chiseled stone. It usually carries five tons and is provided with a windlass and false bottom for the convenient discharge of the cargo. This type of vehicle is pulled by from six to twelve horses, one placed between the shafts, the next pair side by side, and the others arranged tandem fashion. It will be readily understood that such an outfit is, compared with a compact motor wagon, both uneconomical and exceedingly difficult to control. Its presence in congested traffic cannot be excused.



The "Binard."



The "Charette."



The "Tombreau."

The "charette" is another of the vehicle types which builders and contractors would like to see superseded. It is a long-bodied, high-wheeled affair, open front and rear to permit the carrying of lumber, ladders, scaffolding and similar lengthy building apparatus and material. Its maximum load is four tons.

It will be easy to provide a mechanical substitute for the "tombreau," which carries sand, stone and gravel loads varying between four and five tons.

The tests between the competing motor and horse vehicles will be conducted for ten hours every day for a period of three or four weeks. Each unit will cover 28 miles daily. The maximum speed for the motor wagons will be six miles an hour. The association of contractors and masons has promised to purchase the machines which make the most economical showing in the trials, and will award money prizes to the makers of the models which perform to best advantage.

It is to be expected that establishments which represent the commercial motor vehicle industry in this competition will not fail to take full advantage of the potential auxiliary uses of the power plant of the machines. Wherever, in loading and unloading, it is possible to replace the costly element of human labor by mechanically operated devices the economy of the latter will be practically demonstrated.

Many rural mail carriers are now using high wheeled motor buggies in covering their routes.

Being dissatisfied with the quality of the trolley car service, Pittsburg's south side business men threaten to operate motor buses in competition unless a marked improvement is soon visible.

A year ago the authorities of Vancouver, B. C., bought two motor hose wagons and one motor driven chemical engine. The machines have given such satisfaction that an order has been placed with the makers for another of each type.

Milk is being transported by motor truck between Greenwood and Indianapolis, a distance of twelve miles. It is expected that eventually nine machines will be used in such service by one company which gets its supplies from the local dairy region.

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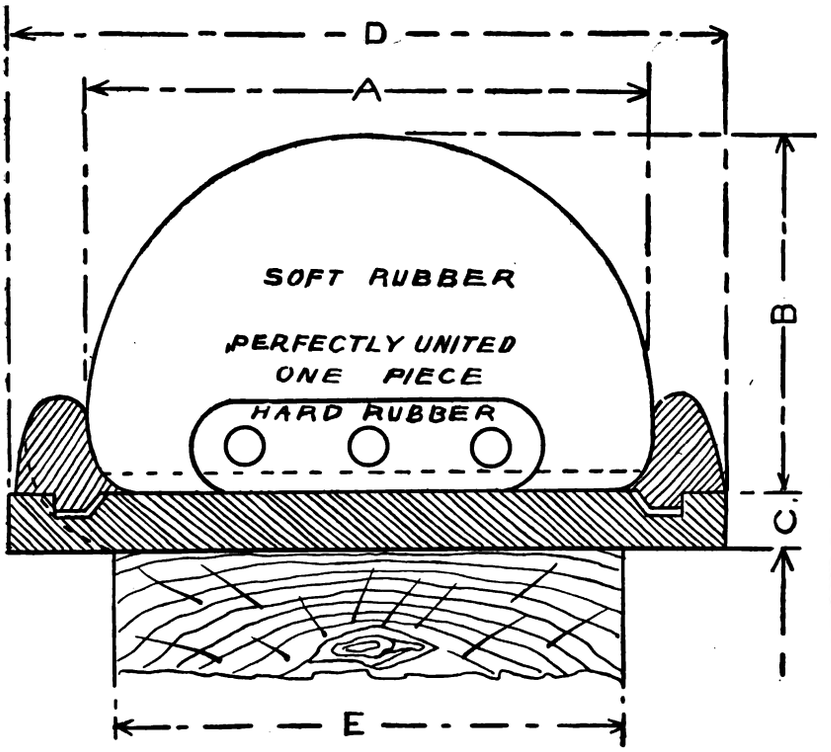
Here At Last! The M

Hard Rub

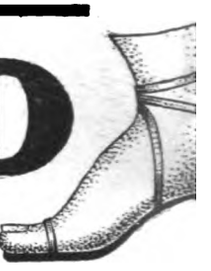


Insures you **two to three times the mileage** of an the market. Study the construction of this new Goody these pages. Notice that the wires are imbedded in a b By our own exclusive process, this hard rubber base is **practically one piece,** and cannot be torn apart under t

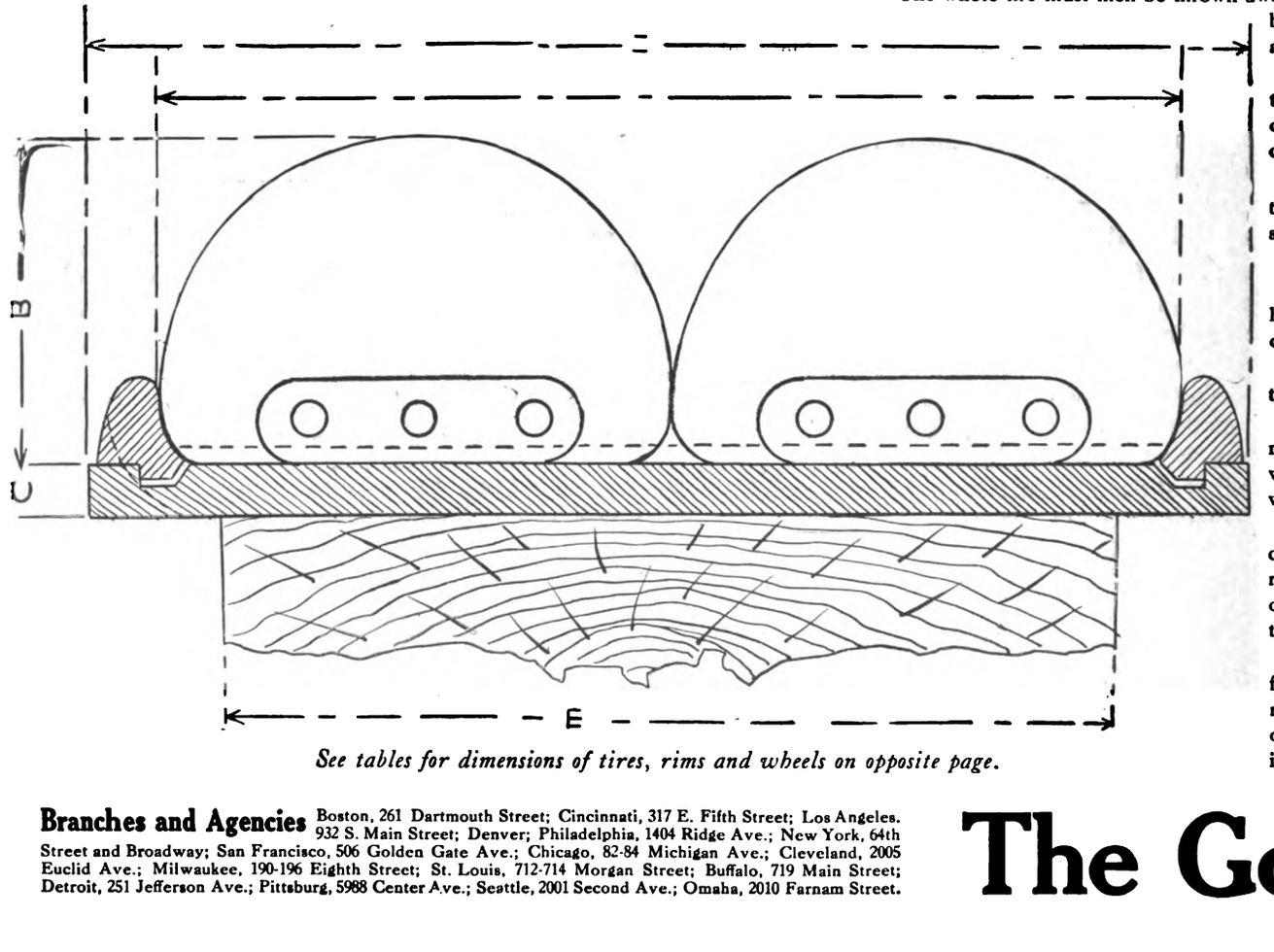
The Goodyear Tire will wear clear down to the c Trucks have run 7,000 miles, and except for natural

Remember—the only practical motor-truck tires wit

GOOD



In the ordinary commercial vehicle tire, the rubber breaks loose f cross-pins, or whatever the fastenings, long before the tires are worn o The whole tire must then be thrown away, no matter how many hu be good for without this tro and an expensive loss too.



These new Goodyear truck Tires in actual u channels, held just as se ded in hard rubber, as th

They thus give two to t tire of ordinary constructio step ever made towards tire

The diagrams make the

The tire is made endless hard rubber in a way that cutting out.

The hard rubber casing tire, thus insuring great resili

The tire is fastened to a nish promptly) with which which is countersunk in a when riveted to the base rim

Our rims have the sa diameters as the endless rim now used for side wire quently there need be no the wood wheel diameters.

Especial attention is c fact that in applying dual t necessary to have the extr on the wheel. The load t is thus materially lightened

See tables for dimensions of tires, rims and wheels on opposite page.

Branches and Agencies Boston, 261 Dartmouth Street; Cincinnati, 317 E. Fifth Street; Los Angeles. 932 S. Main Street; Denver; Philadelphia, 1404 Ridge Ave.; New York, 64th Street and Broadway; San Francisco, 506 Golden Gate Ave.; Chicago, 82-84 Michigan Ave.; Cleveland, 2005 Euclid Ave.; Milwaukee, 190-196 Eighth Street; St. Louis, 712-714 Morgan Street; Buffalo, 719 Main Street; Detroit, 251 Jefferson Ave.; Pittsburg, 5988 Center Ave.; Seattle, 2001 Second Ave.; Omaha, 2010 Farnam Street.

The Goodye

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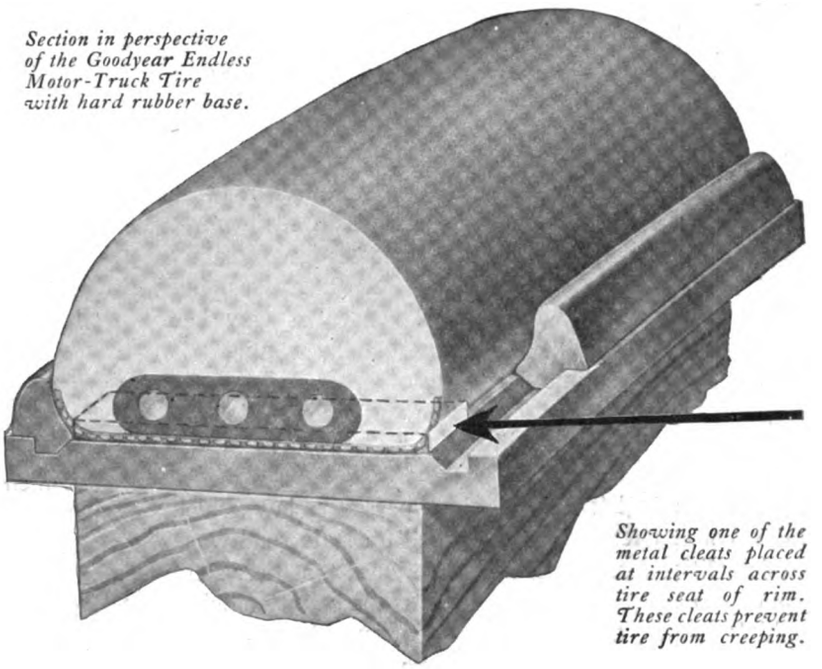
lotor-Truck Tire With ber Base

ther truck tire on ar Tire shown on se of hard rubber. **ENDLESS** so perfectly united to the soft rubber that they are e heaviest loads.

annel and still be good. Our tires on New York ear are in as good condition as the day applied.

hard rubber base, made in America, are the

YEAR



Section in perspective of the Goodyear Endless Motor-Truck Tire with hard rubber base.

Showing one of the metal cleats placed at intervals across tire seat of rim. These cleats prevent tire from creeping.

om the retaining wires, bolts, t.

dred miles of service it would ble. The tire is a total loss—

Hard Rubber Base Motor- have worn down to the urely by the wires imbed- day they were put on.

ee times the mileage of any . It is the longest and best conomy.

onstruction plain.

nd the wires are embedded in bsolutely prevents them from

only a small percentage of the icy and load-carrying capacity. ecial rim (which we can fur- used a split-side ring or flange, oove in the base rim, which ractically makes it one piece.

e internal which are e, conse- anging of

led to the s it is not steel band e carried

Our tires are positively prevented from creeping by metal cleats fastened at intervals to the tire seat of the rim, as shown in the illustration. These cleats fit into slight depressions in the base of the tire.

No special tire-applying machinery is necessary to put on these Goodyear Tires.

The only tools required are a mallet, and one or two leaves of an old spring, or any sharp flat piece of steel which can be used for prying.

The side ring, which is split, is easily applied, and firmly fastened by rivets. These rivets can be obtained at any hardware store.

To take off the side-split ring simply remove the rivets by the use of a hand punch and hammer. Notice that the entire fastening is thoroughly embedded in rubber, and consequently **cannot rust.** The fastening is at the base of the tire and the side flanges are extremely low, thus giving the rubber ample room to expand under pressure, making it easy riding.

But you must see these tires to appreciate them.

Call on or write to the Goodyear factory, or any of our branch agencies, for samples of these tires. We will send them to you for inspection, or if you so desire our representative will make a personal call to demonstrate them.

Give us the size of the tire you are now using, together with the load you expect your trucks to carry, and we will figure the right size tire for **your** use.

You will find the Goodyear Hard Rubber Base Motor-truck Tire very reasonably priced — and considering the mileage it gives—by far the **lowest priced** commercial vehicle tire made. It is a money saver. Let us hear from you.

Dimensions for Tires, Rims and Wheels

Goodyear Motor Truck Tires for Commercial Vehicles

Rim, Rubber and Wheel Dimensions in Inches

		2	2½	3	3½	4	5	6	7	3&3	3½&3½	4&4	5&5
Nominal size of tire													
Width of rubber.....	A		2 5/8	3	3 1/2	3 15/16	4 15/16	5 15/16	6 15/16	6	7	7 1/8	9 7/8
Height of rubber	B		2 1/4	2 1/4	2 1/2	2 1/2	2 3/4	3	3 1/4	2 1/4	2 1/2	2 1/2	2 3/4
Thickness of channel web	C		1/4	5/16	3/8	3/8	3/8	1/2	1/2	1/2	1/2	1/2	1/2
Extreme width of channel	D		3 1/2	3 3/4	4 1/2	5	6	7	8	7	8	9	11
Width of felloe.....	E		2 1/4	2 5/8	2 7/8	3 5/8	4 3/8	5 1/4	6 1/8	5 1/4	6 1/8	7	9

Diameter and Circumference of Wood Wheels

Over-all Dia. of Tire	2 inches		2½ inches		3 inches		3½ inches		4 inches		5 inches		6 & 7 inches		3 & 3 inches		3½ & 3½ in.		4 & 4 inches		5 & 5 inches	
	Dia. INCHES	Cir. INCHES	Dia. INCHES	Cir. INCHES	Dia. INCHES	Cir. INCHES	Dia. INCHES	Cir. INCHES	Dia. INCHES	Cir. INCHES	Dia. INCHES	Cir. INCHES	Dia. INCHES	Cir. INCHES	Dia. INCHES	Cir. INCHES	Dia. INCHES	Cir. INCHES	Dia. INCHES	Cir. INCHES	Dia. INCHES	Cir. INCHES
30 inches	25 1/2	80 1/8	25	78 9/16	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
32 inches	27 1/2	86 3/8	27	84 13/16	27	84 13/16	26 3/4	83 1/4	26 1/2	83 1/4	25 3/4	80 7/16	25 3/4	80 7/16	26 5/8	83 11/16	26 1/4	82 9/16	26 1/4	82 9/16	25 1/2	80 1/8
34 inches	29 1/2	92 11/16	29	91 1/8	29	91 1/8	28 3/4	89 15/16	28 1/2	89 15/16	27 3/4	87 11/16	27 3/4	87 11/16	28 5/8	89 15/16	28 1/4	88 3/4	28 1/4	88 3/4	27 1/2	86 3/8
36 inches	31 1/2	98 15/16	31	97 3/8	31	97 3/8	30 3/4	95 13/16	30 1/2	95 13/16	29 3/4	93 7/16	29 3/4	93 7/16	30 5/8	96 3/16	30 1/4	95 1/16	30 1/4	95 1/16	29 1/2	92 11/16
38 inches	...	....	..	....	..	....	...	....	32 1/2	102 1/8	31 3/4	99 3/4	31 3/4	99 3/4	32 5/8	102 1/4	32 1/4	101 5/16	32 1/4	101 5/16	31 1/2	98 13/16
40 inches	...	....	..	....	..	....	...	....	34 1/2	108 3/8	33 3/4	106 1/16	33 3/4	106 1/16	34 5/8	108 5/16	34 1/4	107 5/8	34 1/4	107 5/8	33 1/2	105 1/4

Clayton Street

ar Tire & Rubber Co., Akron, Ohio

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Big Profits From Motor Cab Operation

Dividends in excess of $400,000 distributed among investors as a result of fourteen months' service

FROM fourteen months of operation the General Motor Cab Company, of London, has distributed $470,000 in dividends among its stockholders. The trading profit for the period was $808,502. The preferred shareholders have received a 13 per cent dividend. Recently the capital stock of the company has been raised to $8,000,000.

The chairman of the company predicts that small operators will be unable to endure the competition which large ones are capable of offering. There is doubtless a great deal of truth in the observation, although one would hardly suspect it from the brilliant trading record just set forth. The basis of the prediction is the heavy investment which the General company has made in permanent plant and equipment for the scientific administration of its vehicles. Already the company has invested $551,510 in land and buildings. Its repair shops are the most complete of their kind in existence. All told the company has spent $1,000,000 for garage accommodation and the equipment necessary to keep its vehicles in the best possible condition.

* * *

It is this investment, and the perfect service it guarantees, which stands in the way of minor cab enterprise. Concerns with small means and resources cannot duplicate it, and their operating costs are proportionately high. Still there is no lack of new companies, with capital rating varying between $500,000 and $1,000,000, which believe that no single concern can secure a monopoly of the streets so far as cab service is concerned. The newcomers are calculating upon a drying up of the present principal sources of vehicle supply, which are chiefly European. It is continually becoming harder to obtain vehicles from French factories. The development of native cab production, therefore, becomes an object of great solicitude on the part of the General company's competitors.

* * *

The General company has about 1,200 machines in commission at present. The factories from which it obtains its machines have orders on hand for about 2,500 more. At first the company bought nothing but French cabs. Recently, however, it has been buying native machines. It is expected that eventually the company will have about 5,000 vehicles in service. It might seem that this company would be more than sufficient to supply the needs of traffic. No such opinion, however, is entertained in expert operating circles, where the theory of the motor cab developing its own traffic, as well as falling heir to that of the horse-drawn cab, is very well understood.

* * *

It is important to observe that at the present moment much of the profits from motor cab operation are being re-invested in the business. High as the earnings are, they are yet not great enough to provide new vehicles and buildings as they are needed. The company with the deepest purse has all the advantage in such a situation. It is this fact which should give small operators the liveliest concern. Since it is inevitable that individual machine earnings will sink as competition increases and vehicles become more numerous, the profits of the business in the future are not likely to be as large as they have been in the past. Consequently more money will be required to produce the same results which are visible to-day.

* * *

During fourteen months, ending July 31 last, the following items of expense were incurred in the administration of the General Motor Cab Company's business:

Directors' fees	$12,139
Salaries, rent and general expenses	38,179
Advertising	12,590
French taxes	13,214
Legal charges	4,281
Interest	3,268

It will be understood by those familiar with motor cab operating practice that the salary charge in the above table does not include the wages of the drivers, who are paid a percentage of vehicle receipts.

The chief assets and liabilities of the concern are to be found in the following table:

ASSETS.	
Land and buildings	$ 551,510
Rolling stock	2,183,304
Machinery, fittings, etc.	43,948
Materials	77,260
Holdings in other companies	188,798
Miscellaneous assets	311,688
Cash	139,339
LIABILITIES.	
Capital issued	$2,937,532
Bank loans	96,772
Sundry creditors	432,542
Reserve against rolling stock	173,520

HOTEL TO OPERATE ITS OWN CABS.

THE proprietors of the Knickerbocker Hotel, of New York City, have for some time past been endeavoring to cancel the privilege which it gave to the New York Taxicab Company, allowing the vehicles of the latter concern to furnish service to the guests of the establishment. Naturally the holders of the privilege resisted. The situation became acute, however, when in the course of the strike among the drivers of the cab company the hotel property became the object of vicious attacks and the lives of guests were put in peril. The Universal Taximeter Company has now been organized with the manager of the hotel at its head. Fifty machines are being imported from Scotland.

A motor driven fire escape has been added to the fire department equipment of Shanghai, China.

Motor bus service has been resumed between Sacramento and Fair Oaks, Cal. Five trips are made daily.

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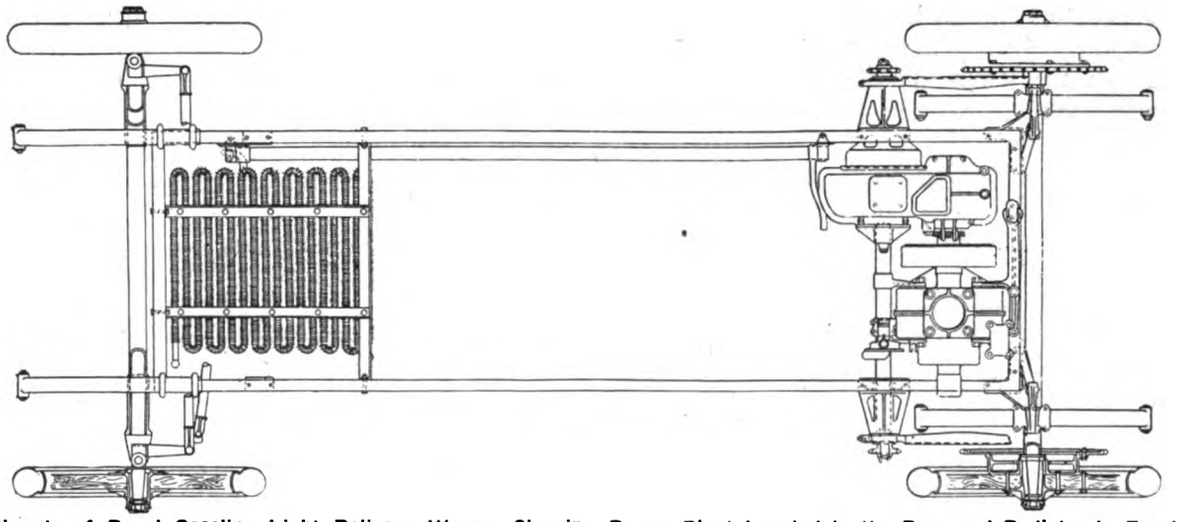

Chassis of Roval Gasoline Light Delivery Wagon, Showing Power Plant Located in the Rear and Radiator in Front.

Foreign Design To Be Produced Here

Structural details of the Roval light delivery wagon which can be fitted with pneumatic tires

PLANS are now being matured for the formation of an eastern company which will undertake the sale and maintenance of a large number of Roval light delivery wagons, a type of construction which has acquired considerable vogue in France. The source of supply for these machines, however, will be in this country, provided satisfactory arrangements can be made with a well known and wealthy Pennsylvania establishment which now has the matter in hand.

* * *

The construction of the Roval gasoline wagon is unusually interesting. The vehicle is intended to carry loads up to 1,200 pounds. Driving mechanism and operator's seat are located in the rear, a departure from orthodox construction which is not without its special advantages. At first glance the machine seems a little freakish, but careful study of its design makes it quite plain that each unusual feature of the engineering is well justified. In a sense the popularity of the machine in France is an indorsement of its economy.

If present plans do not miscarry the selling company which is being organized will contract for the construction of 250 machines to be delivered within the period of a year. No sale price has as yet been put upon the product, although it is understood that it will not list higher than $1,000. The lightness of the vehicle, and the small loads it is designed to carry, make possible the use of pneumatic tires. The weight of the fully loaded vehicle is only 2,400 pounds.

* * *

The wagon is fitted with a 6 hp. single cylinder engine, which gives a maximum road speed of 19 miles an hour on the level. Engine, transmission and differential form one unit, which is placed transversely above the rear axle. This unit is kept rigid by a tie rod running from the differential to the bottom of the gear case casting. It is relieved of bending and twisting stresses by three point suspension.

The frame, of armored wood, runs straight and is 30 inches wide. The driver's seat and its support are formed of sheet steel, the support resting on the transverse rear member of the frame. One or two seats of bucket shape are provided. The driver is perched well above the body or load and is thus provided with an unobstructed view for steering.

* * *

The body of the wagon does not over-hang. It is suspended between the axles. The standard body dimensions are as follows: Length, 6 feet; width, 39 inches; cubic capacity, 50 feet. Three-quarter elliptical springs are fitted in front, passing underneath the front axle. They are fastened in front to the top of the frame side members, and shackled at their rear ends. The rear springs are full elliptic, resting on the rear axle.

The wheel base is 96 inches. The gauge is 48 inches. All road wheels are 27½ inches in diameter. The starting handle projects through the sheet metal frame which is carried up to support the driver's seat.

High tension magneto is used in ignition. The splash system of lubrication is used. The water tank is located in front of the engine. The radiator is carried in a horizontal position in the fore part of the machine and connected to the water tank by two pipes. The fuel consumption is low, 25 miles on a single gallon in ordinary service. A leather to metal cone clutch is employed. There are three forward speeds, 4, 10½ and 19 miles. The final drive to road wheels is accomplished by two side chains which run over sprockets fixed to the ends of the differential shafts.

* * *

The steering arrangement is as follows: A long tubular rocking shaft is supported in bearings inside the main frame and fitted with a hanging lever at its front end, from which a universally jointed control rod is taken to the near side front wheel. A tie rod, connecting the two steering arms, is placed behind the axle. To the rear end of the

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rocking shaft is fitted another lever connected to a vertical rod, the upper end of which forms a rack in mesh with a small pinion on the lower end of the steering spindle. Thus all movements of the steering wheel are communicated to the front wheels.

Two internal expanding brakes are placed on the chain wheel drums of the rear wheels. Another brake is fitted to a drum on the differential shaft.

DEATH OF GEORGE A. BURNHAM.

WHILE duck hunting on November 14, George A. Burnham, factory manager for Morgan & Wright, of Detroit, was killed by the accidental explosion of his gun. He was born in 1874. In 1893 he optained employment in the bicycle tire department of the Morgan & Wright plant, then located in Chicago. He soon became superintendent and factory manager. When the firm moved to Detroit his genius for economical production was freely exercised. He planned the erection of a model rubber goods factory, arranging its equipment and departments in such a manner as to insure low operating cost and maximum production. That achievement alone is a monument to the man's talent. Of his social qualities it seems trivial to say that he was greatly esteemed by his associates and all who knew him. Esteem, however, is dearly won. The automobile tire industry will long mourn the loss of Mr. Burnham.

The horse stage plying between Wallowa and Joseph, Ore., has been superseded by a motor bus.

Motor buses, with capacity for 30 passengers and mail and express matter, will soon be operated between Blair, Tonopah and Goldfield in Nevada.

This winter freight is to be hauled by motor truck between Wooster and Cleveland in Ohio. Similar service will be established between Plymouth and Wooster.

THE GRAMM-LOGAN THREE TON TRUCK.

IN THE product of the Gramm-Logan Motor Car Company, of Bowling Green, Ohio, the three-ton truck occupies the most conspicuous position. It is fitted with a four-cylinder, 40-h. p. engine. The cylinders, which are cast in pairs, are so arranged as to bring the valves, intake, etc., on the right side of the motor. This is a reversal of practice in the design of motors of this type. The cylinders are offset one inch from the crank shaft in order to reduce friction on the explosion stroke and permit smoothness and quietness of operation. The two weak points in cylinder design, the head and flange, have received special attention and are unusually strong. The gear case is cast integrally with the crank case. The clutch is of the multiple disc variety. The final drive is accomplished from jack shaft to rear wheels by side chains. The tire equipment is 36 by 5 inches in front and 36 by 3½-inch twins in the rear. The wheel base is 120 inches. The tread is 60 inches.

FIFTY BUSES FOR TORONTO.

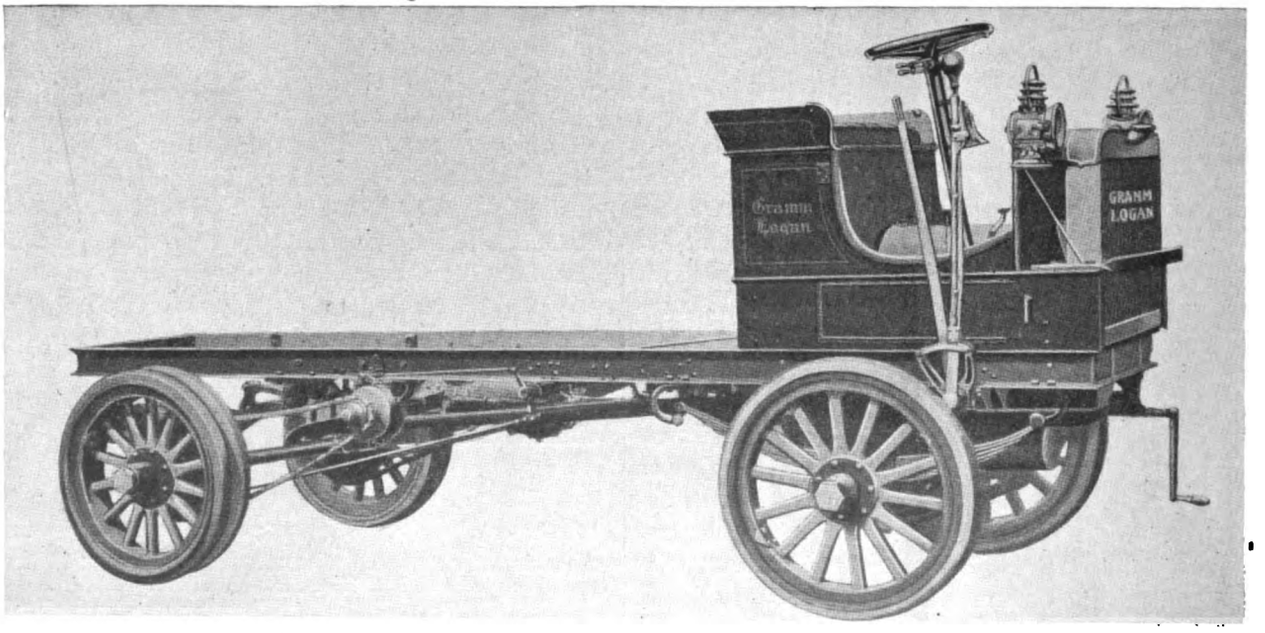
IN Toronto, Canada, a motor bus company is being formed to compete with the street car system. Within six months fifty machines are to be running on four routes. The company is capitalized at $2,000,000.

KNOX AGENCY IN RHODE ISLAND.

KNOX machines will be represented in the state of Rhode Island by the Hitchcock-Banks Motor Car Company, of Providence, R. I. An aggressive campaign is being arranged.

In Paris there are motor cabs which compete on even terms with horse cabs so far as tariff is concerned.

Motor stage service is being furnished between Yreka and Etna, Cal.



The Gramm-Logan Three-Ton Gasoline Truck.

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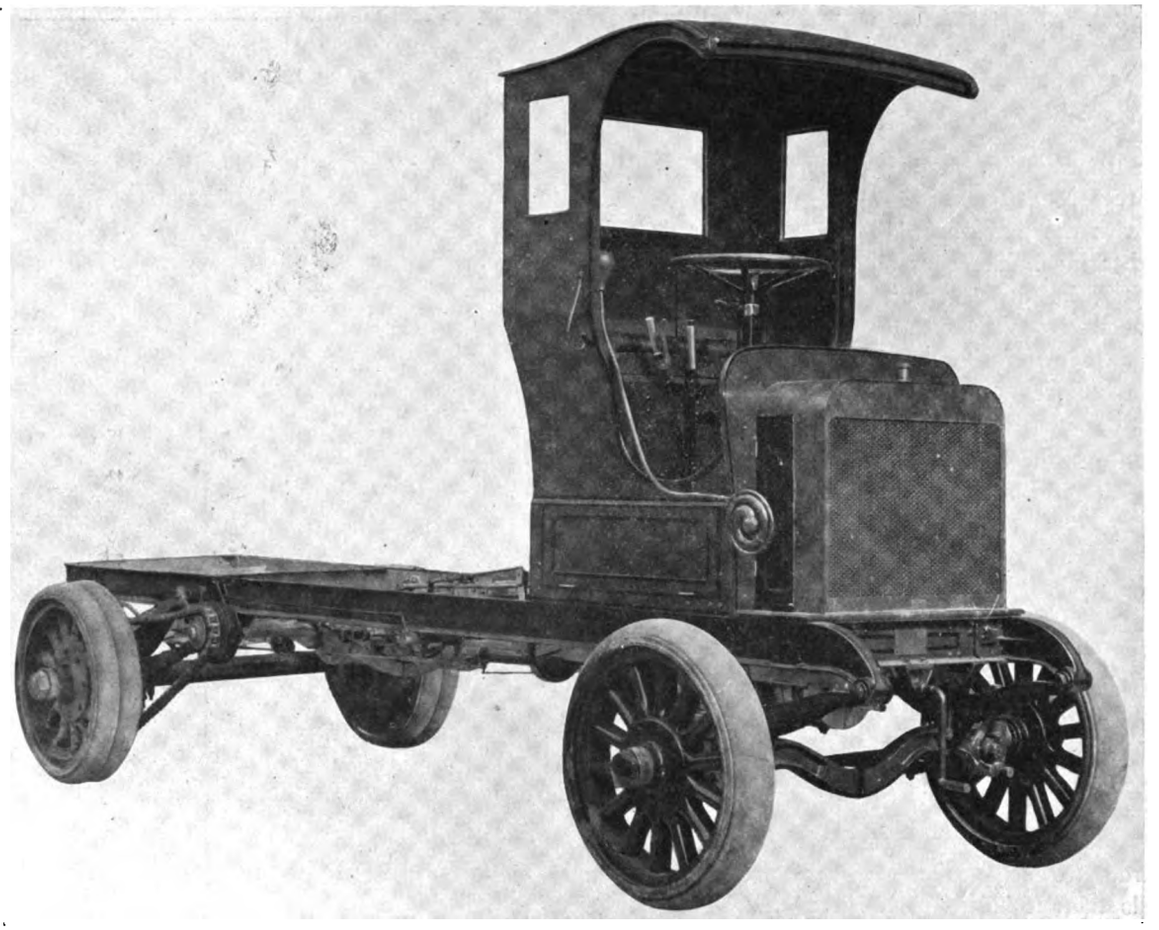

Five-Ton Gasoline Truck Made by the Rapid Motor Vehicle Co.

"Rapid" Heavy Duty Model

Particulars of a new five ton gasoline truck which is fitted with a 50 h. p. engine

AN overload of two tons may safely be carried on the five ton gasoline truck made by the Rapid Motor Vehicle Co., of Pontiac. Upon occasion it may be loaded with greater liberality, for it has the strength and the engine power to transport all its platform will carry. The total length of the chassis of the standard model is 18 feet 3 inches. The wheel base is 160 inches. The tread is 66 inches in front and 76 inches in the rear. The platform is 37 inches from the ground. The front tires measure 36 by 6 inches. The rear tires, of twin pattern, measure 36 by 4 inches.

The 60 hp., four cycle, four cylinder, vertical engine, with 5½ inch bore and 6½ inch stroke, was especially designed for this model. The cylinders are cast in pairs. The heads are made integral with the cylinders, as are also the valve chambers. The connecting rod and piston, being of extra length, give a low angular pressure on the cylinder walls. Inlet and exhaust valves are located on the left side of the motor. The valve heads are electrically welded to stems of large diameter. The valve guides are long and can be easily removed for replacement. The crank shaft is of hammer-forged nickel steel, cut from a solid billet. The cams are of such design as to impart a uniform accelerated motion to the cam followers, thus giving these parts less shock and practically eliminating noise. This construction also secures a greater length of valve opening. The crank case is very rigid, but not too heavy. The crank shaft is supported in the upper half of the case by three bearing caps.

Lubrication is accomplished by force feed oiler. The circulating water pump is of the centrifugal type, gear driven. The circulating pipes are short. The intake pipe is so curved as to allow the greatest freedom for the incoming gas. It can be taken off without disturbing the exhaust pipe. The exhaust pipe is unusually large, and the branches from the various cylinders are shaped to allow the greatest freedom for the outgoing gases. It can be taken off without disturbing the intake pipe. The fly wheel forms part of the clutch housing. The commutator is placed between the two central cylinders. It can be readily detached if magneto ignition is required. The magneto is placed on the same side of the motor as the valves, carbureter, circulating pump and oiler. All the possible sources of engine trouble are grouped. This means a saving of time when locating them. Throughout the truck the construction is such that parts are easily accessible and removable.

Plenty of power is held in reserve. The clutch is of

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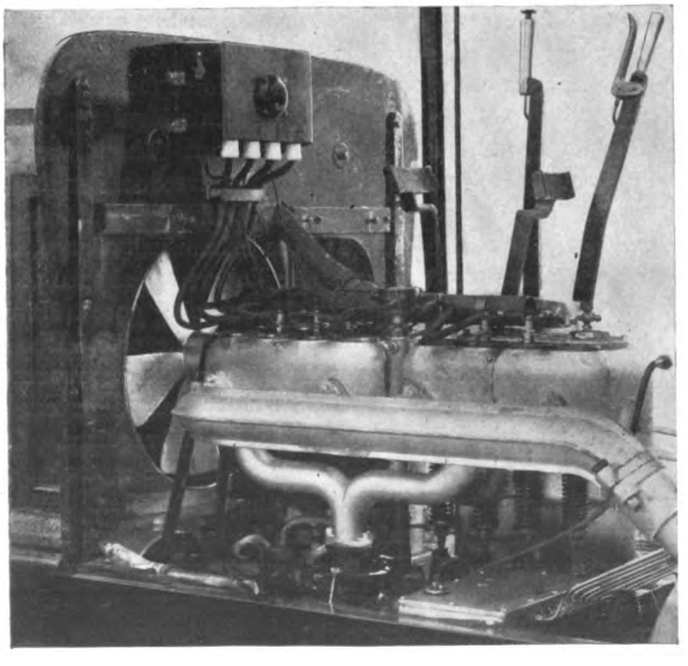
the multiple disc type, and is inclosed in the fly wheel. The discs have an unusually large frictional surface. The short propeller shaft is provided with a universal joint at each end. It is in a straight line with the crank shaft of the motor.

The transmission is of the selective sliding gear type, giving three speeds forward and one reverse. It is made integral with the jack shaft. The jack shaft is mounted on roller bearings. The sprockets are comparatively large. The shifter yokes are made integral with the shafts. Thus they cannot work loose. One shifter is brought to a neutral position before the other can be taken up. This eliminates the danger of bringing two different gears into mesh at the same time. The hand lever controlling the speeds requires no complicated movements or H quadrants in its operation. It will not confuse the operator.

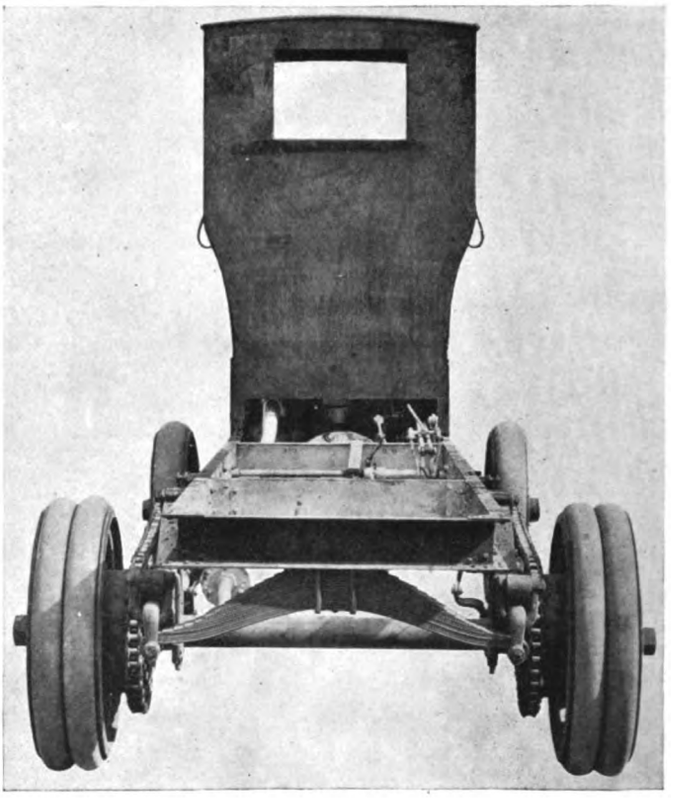
The jack shaft brakes are of the contracting band type, and are lined with a non-combustible material. The pull rods are provided with an equalizer to insure an even distribution of pressure on the brakes. The front axle is of I-beam construction of large section. The rear axle is of round section

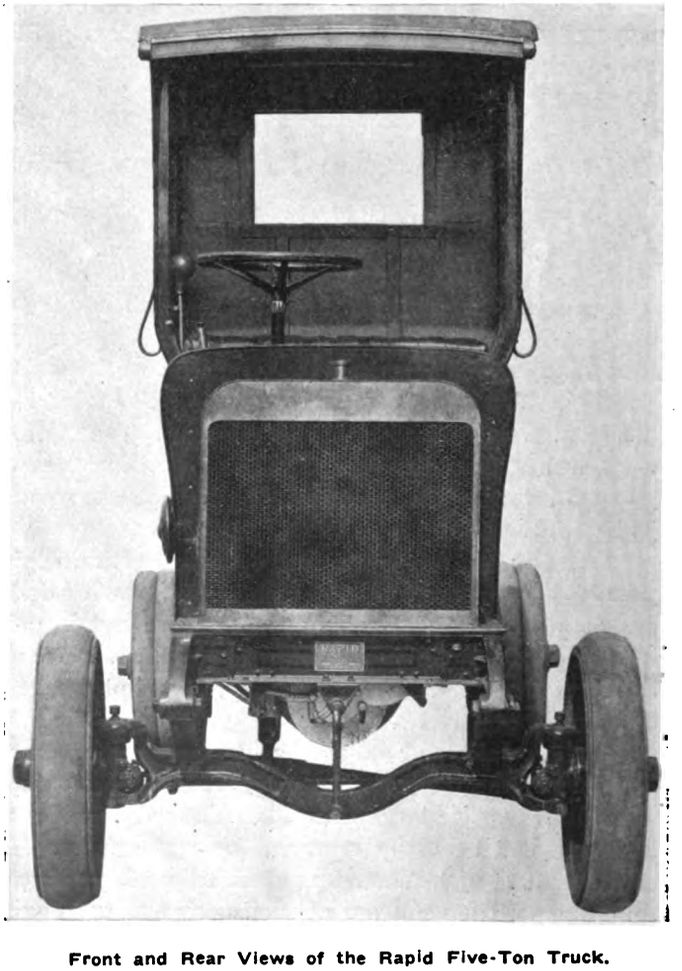
The radius rod uses the axle as a central pivot at one end and the transmission tube at the other, giving the same centers between these two important points. This provides even tension on the side chains, and affords good chain service. The rear sprockets are of large diameter, bolted direct to each spoke, giving a larger leverage to the wheels than if bolted to hubs only. The chains are 1¾-inch pitch.

The frame is of heavy channel steel. The sub-frame supports the motor. The steering gear is of the irreversible screw type. The fore and aft rod is provided with a flexible connection which takes up all initial road shocks. The front springs are semi-elliptic, the rear full platform. The rear brakes are of internal expanding type. They are also lined with non-combustible fiber.



Left Side of Engine of the Rapid Five-Ton Truck.





Front and Rear Views of the Rapid Five-Ton Truck.

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Wagon Maintenance

Tips to drivers and caretakers about things which are likely to escape their attention

STARTING in cold weather is facilitated by warming the cylinders by squirting gasoline into them and firing it with a match at the compression cocks. A few drops of gasoline in each cylinder is all that is necessary, and the match is held to each open compression cock in turn. The resulting small explosion imparts just enough heat to the walls so that, after the crank has been turned twice to expel the burnt gases, fresh injections of gasoline will evaporate and ignite at once on turning the crank. Obviously, before resorting to this device, one should make sure that there is no stray gasoline vapor about, such as might be due to excessive and fruitless priming of the carbureter.

* * *

Gear Engagement.

The clutch should be thrown as far forward as possible before any attempt is made to engage the gears. The different types of clutches in use and the care bestowed on them has much to do with the ease with which the gears may be engaged. The cone clutch, with its comparatively large diameter, is likely to spin longer than the multiple disc. Any attempt to mesh the gears while the clutch is spinning will result in the gears growling, possibly chipping the teeth. Few types of clutch can be depended on to stop spinning as soon as the clutch pedal is pressed, and it is advisable to wait a moment or two before attempting to engage the gears. Occasionally the shaft will stop so that the teeth of one gear will strike the teeth of the other and prevent them meshing. When this occurs engage the clutch again for an instant, thus letting the clutch shaft spin, and after giving them time to stop spinning try to mesh the gears again. After the car has started and it is desired to shift from first to second, etc., speed the engine for a moment, close the throttle, then release the clutch and shift the gears. If the engine has not reached too high a speed this will allow the gears to engage quietly.

* * *

Starting the Motor.

If a motor does not start on the first turn of the crank there is nothing radically wrong. On the first turn the resistance due to compression may be felt, but the vapor compressed may not be a combustible mixture. It may be necessary to throw all four pistons over, and this will allow all four cylinders to be filled with a fresh charge of gas. The motor will then usually start on the next turn. While the modern carbureter is very sensitive, the height of the gasoline in the standpipes, as controlled by the float, may be adjusted so low that the suction from the motor, when turned over by hand, is not sufficient to raise any gasoline, yet when running will work perfectly. There is what may be termed a critical adjustment to all types of carbureters, and each has a corresponding throttle opening that has a great deal to do with the labor necessary to start the motor. This adjustment is not alike on any two carbureters and may range from a throttle opening of two or three notches to half or three-quarters on the control quadrant. If the throttle is open too much, and the motor being turned over by hand, the inlet valve is open for an appreciable length of time, and the piston is traveling at a very slow rate of speed in comparison to that when running. Under these conditions the rate of speed of the air currents flowing through the carbureter is so low that gasoline is not drawn from the spray nozzle, and though a certain amount of vapor is lifted by the column of air passing over the gasoline, the quantity is not sufficient to make a mixture that will ignite. On the other hand, if the throttle is not open enough the motor will choke itself, drawing too much gasoline. The suction is strong enough to draw the gasoline, probably in the form of fine drops, into the cylinder, where it is vaporized under the heat of compression and will either provide a mixture too rich to ignite or one that will burn so slowly that sufficient power is not developed to carry the motor over the following compression. Many motors will not run satisfactorily till thoroughly warmed up, and the warm-air inlet or hot-water jacket to the carbureter cannot furnish their necessary quota of heat until the motor has been running for some little time.

* * *

Cranking With the Left Hand.

In cranking the man who uses his left hand has the advantage. Grasping the handle, as he does, with the fingers curved, when a back fire occurs the arm is thrown outward, the fingers are opened, and no damage is done. Again, the left-handed operator squarely faces the car, and by reason of the distances between his feet, and a firm grip on the radiator or dumb iron with his right hand, it is next to impossible to throw him from his balance. The hand grasping the dumb iron also assists in the exertion of more strength on the starting crank. With low tension ignition it is essential that the motor be turned over quickly in starting, and this can be more readily accomplished if the left hand be used. Of course there should be no back fire, but it is well enough to have things in such shape that when one does occur it will do a minimum amount of damage.

* * *

Don't Force Gears Into Mesh.

Never attempt to force the gears into mesh. If they will not engage without being forced there is something wrong, and jamming down hard on the lever is only liable to aggravate the trouble or spring the shifting arm or lever. The noise so frequently heard is caused by the attempt to force the gears together while they are traveling at different rates of speed. This serves to grind and chip the edges, occasionally breaking the teeth. Judging from the condition of gears in the repair shop, the only conclusion is that the average driver seldom waits long enough before attempting to engage first speed

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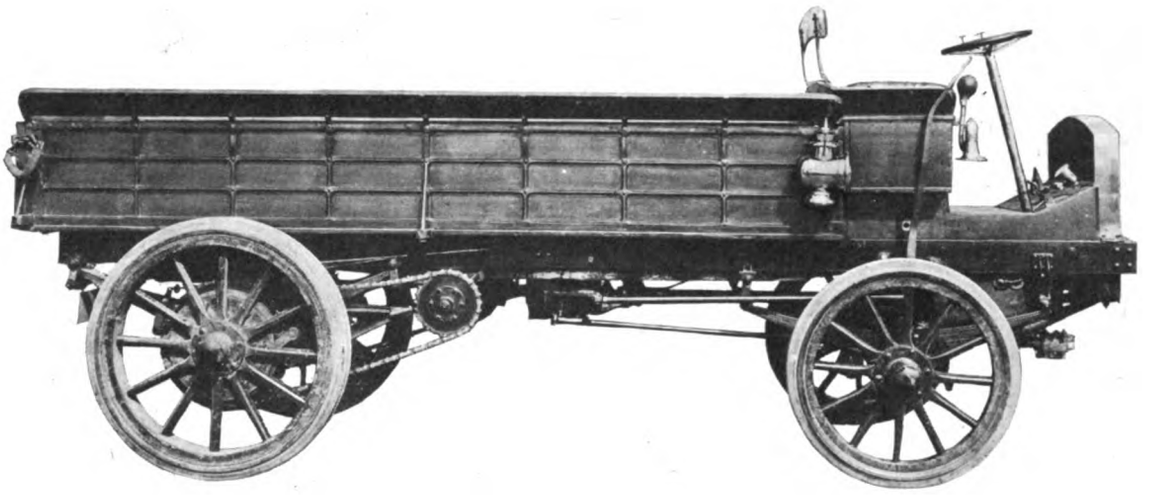

Gasoline Truck Made by the Carlson Motor and Truck Co.

Novel Features of the Carlson Truck

The engine and transmission contain principles of design never before incorporated in a motor vehicle

IN looking over the commercial motor vehicles built by the Carlson Motor and Truck Co., of Brooklyn, N. Y., one's attention is first fixed by the design of the engine and transmission. The engine, rated to develop 24 hp., is of the four cylinder, four cycle, direct opposed, horizontal type. Access to its principal parts is easily obtained by removing the foot boards beneath the driver's seat. The transmission is of the epicyclic type.

The engine is a remarkably simple, light and compact affair. It contains about half as many working parts as are usually found in four cylinder, four cycle motors. Its design is protected by patent. The design of the transmission is similarly guarded. In the Carlson motor the valve stems are fitted into guides with as much care as the pistons in the cylinders. This is done for the purpose of insuring accuracy in valve seating. The hollow wrist pin is clamped rigidly in the connecting rod, and is therefore a part of it and not of the piston. This gives double the bearing surface provided by the usual method of construction, and supplies it where it is needed—at the ends of the wrist pin. Two connecting rods on one crank pin give a very short crank shaft for a four cylinder motor, and make it possible to fire the cylinders in sequence (1, 2, 3, 4) and thus practically eliminate motor vibration.

The transmission provides two forward speeds and a reverse. It contains a multiple disc clutch and three gears, which are always in mesh. The final drive is by jack shaft and chains to road wheels. The sprockets are large and when the machine is loaded the pull on the driving chains is straight. The engine is fitted with a double carbureter and an automatic commutator,which is also a spark governor.

The Carlson company is building wagons and trucks ranging in capacity from one to three tons. It will undertake the construction of models for heavier duty upon special order. It is quite interesting to know that the company guarantees its engine and transmission for the period of a year.

In other respects than those already described the Carlson design is of orthodox character. All models are constructed to stand high overload, in other words, are rated much lower than their actual carrying capacity. The normal speed of the two ton model is 12 miles an hour. Its platform area is 44 square feet. The length of the wheel base is 108 inches. The front tires measure 36 by 3 inches. The rear tires, twins, measure 42 by 2½ inches. The platform is 39 inches from the ground. The extreme length over all of the standard two ton model is 15 feet 3 inches. The fuel tank capacity is 20 gallons. The weight of the chassis is 4,300 pounds. The front axle is of I-beam design. The rear axle is square, 2½ inches on the face. Both axles are fitted with roller bearings.

FORMATION OF HAYES WHEEL COMPANY.

THE Hayes Wheel Company, of Jackson, Mich., has been organized with Clarence B. Hayes as president and general manager. Mr. Hayes has had twenty years' experience in the manufacture of wheels for vehicles of all kinds. The plant which his company operates was formerly owned by the National Wheel Company. Much new machinery has been added to the equipment, however, in order to bring it up to date. Mr. Hayes has surrounded himself with an able corps of workmen and executives.

The Austrian war office owns about thirty motor wagons. Seven are three-ton machines, two haul six-ton loads. four are light vehicles for hospital service, two are used to draw trailers and are provided with four wheel drive. two are tractors which pull ammunition and water supplies, and one is fitted as a traveling repair shop. This accounts for 18 of the machines. The remainder are light wagons which perform transport duties. Ten motorcycles are also in constant commission.

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RELIABILITY WELL PROVEN.

OF TWENTY-SEVEN industrial motor vehicles which recently competed in a reliability test in Austria twenty-six completed the lengthy journeys to which they were assigned without giving any cause for disqualification. This would indicate that the dependability of such machines is at the present moment at an unusually high point. The competing vehicles were divided into three classes. One group covered 450 miles, another 580 and the third 820 miles. The trials lasted ten days. The performance of machines which are available for military service was observed with much interest by war department representatives. As the route included many steep hills there was plenty of opportunity for making brake tests. Upon one occasion one of the machines, while traveling at a speed of 6½ miles per hour, was brought to a stop within three feet.

ECONOMICAL ELECTRIC WAGON SERVICE.

OUT in Los Angeles the Electric Dispatch, a concern which operates electric wagons, makes the bold claim that its transportation is 35 per cent more economical than equivalent horse haulage.

The company has its own garage and machine shop. It employs sixteen vehicles of two, three and five ton capacity, as well as two sightseeing machines, each of which seats thirty passengers. The establishment is a subsidiary of the local street railway company.

A company is being organized to operate motor buses between Cincinnati and Mt. Airy. Machines to carry 22 passengers will be used.

The sum of $5,000 has been appropriated for the purchase of a motor police wagon for Pittsburg.

WILL DISCARD HERDICS FOR MOTOR BUSES.

THE Metropolitan Coach Co., of Washington, D. C., is preparing to convert the character of its entire equipment. For many years it has been operating horse drawn herdics, a type of public service vehicle so ancient as to provoke derision. They will be superseded by motor buses.

In a few months the company will install a 14-passenger motor bus and if its work proves satisfactory ten more will be commissioned. The trial machine, made by the Franklin company, will be expected to cover 120 miles each day. It will only be out of service for 6½ hours during the twenty-four.

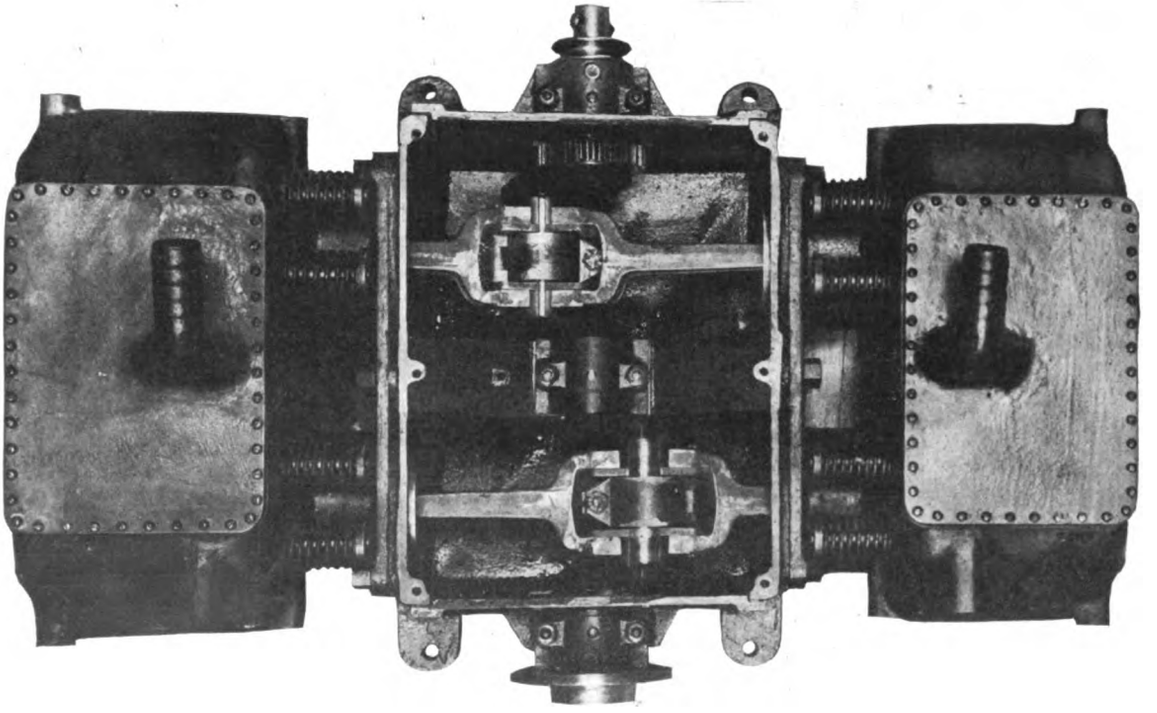
A CORRECTION.

LAST month in describing the motor driven aerial ladder truck built by the Seagrave Company, of Columbus, O., it was stated that the vehicle was equipped with a Frayer-Miller air cooled engine. We have since learned that the power plant of this interesting machine, while bearing a general resemblance to the Frayer-Miller pattern, contains many useful features developed by the Seagrave company, which are protected by patent.

A mechanically operated handcart has been patented abroad. Power is supplied by a small motorcycle engine located between the shafts. The final drive is by means of side chains.

The authorities of Youngstown, O., have decided to purchase a motor driven hose and chemical wagon.

The trustees of Pomona, Cal., have advertised for bids on a 60 hp. motor hose and chemical wagon.



Motor of Carlson Truck, With Crank Case Cover and Cam Mechanism Removed.

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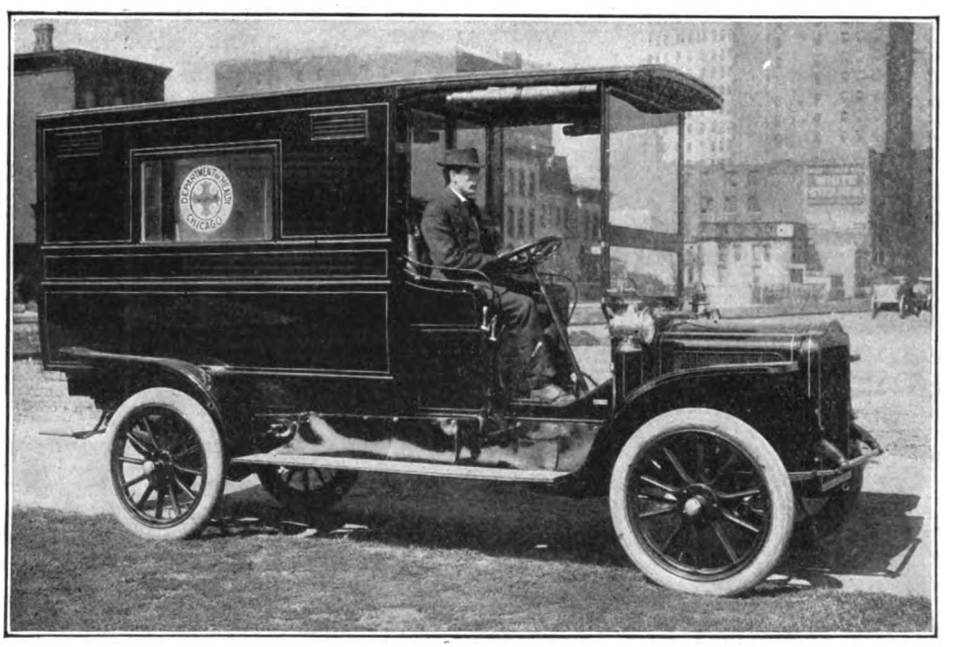

Steam ambulance owned by the City of Chicago.

Public Service Steamers

Many machines of this type are employed in police, military and passenger transportation duty

NOISELESSNESS and lack of vibration aretwo qualities possessed by steam driven vehicles which make them especially suitable for ambulance work. A further advantage of the steam ambulance is the ease with which its speed, from zero to maximum, may be controlled without violent jerks.

In the transportation of the sick or wounded it is often imperatively necessary to afford every convenience which skill can devise. The delicate suspension of the cot counts for little if the vehicle in which the patient is being carried is noisy and trembling from the working of its power plant.

* * *

There are many steam driven municipal ambulances in use throughout the country. The army authorities, too, are partial to their use. In city work their value is well proven, especially in congested traffic where the stalling of an engine, causing interruption in transportation, may so delay medical or surgical aid is to occasion loss of life. The efficiency of the machines in this respect is very high. They are also very economical. So far as the latter advantage can be expressed by work performance and operating cost one steam ambulance is equal to four horse drawn vehicles. At least this is the experience of the department of public health and charities in Philadelphia, which employs two steamers and works them with great activity. In this installation a very considerable saving is effected in wages. In New York and Chicago, where the machines are also employed, a similar economy is apparent.

Nearly all the public service steamers in this country have been made by the White Company, of Cleveland, Ohio. This concern, in discussing the economy of this section of its product, attributes much of the success of the machines to light tire expense, which, considering the weight, is a characteristic of steam vehicle operation. The even application of power not only reduces wear and tear on the mechanism to a minimum, but is of exceptional value in prolonging the life of tires.

* * *

The record of the steamer in military and naval hospital service is a very brilliant one. The machine was first commissioned for governmental duty in 1905. The army ambulances are driven and cared for by enlisted men. Often the pattern is varied so as to permit the accomplishment of multiple service. The machine used at the West Point Military Academy furnishes an example of this mixed duty design. It serves as an ambulance and depot wagon. In police service the machine is frequently fitted for patrol as well as ambulance duty.

The horse drawn ambulance is now generally recognized as an instrument which neither medical nor surgical science can afford longer to tolerate. The existence of a stable upon the premises of a hospital is unequivocally condemned by health experts. Flies, which are the commonest carriers of disease, and other pests have their origin in stables. An insanitary stable is impossible, and the fundamental principle of hygiene is perfect sanitation.

* * *

It is two years since the West Point Military Academy steam ambulance was commissioned. Within that period it has accompanied the cadets in their long annual practice marches. Upon these occasions its speed is regulated to accommodate the movement of a slowly marching column, climbing severe grades and even traveling across fields. Many times during the course of these ex-

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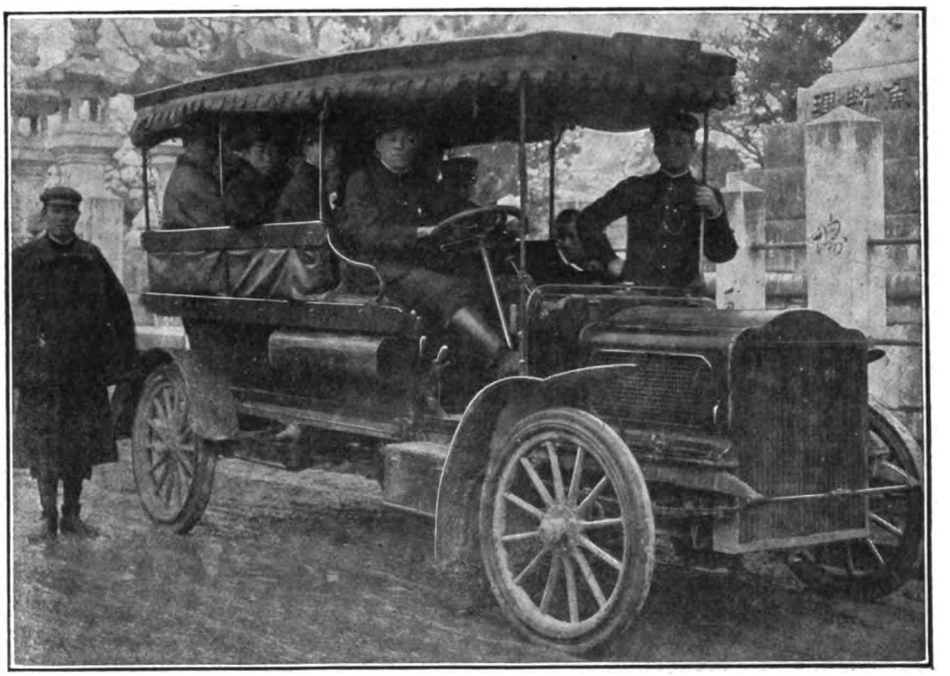
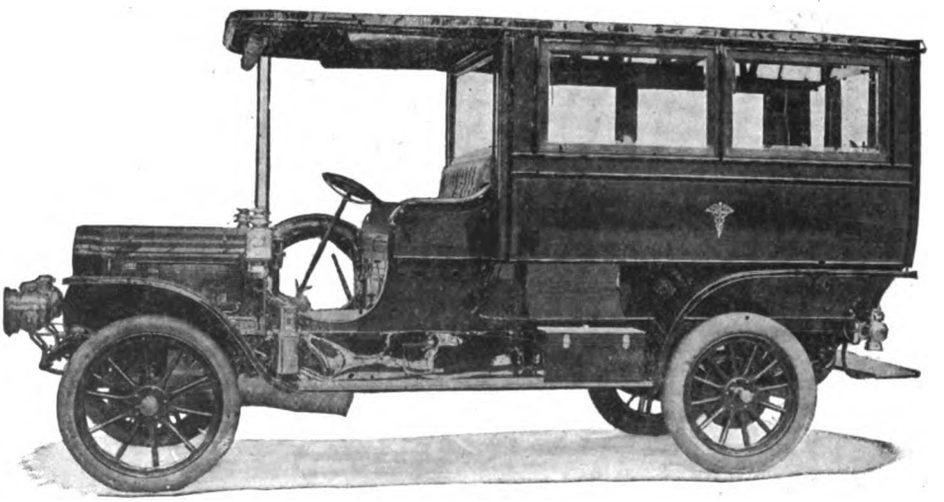


One of the steam buses used in Osaka, Japan.

Steam ambulance owned by the City of Philadelphia.



Steam ambulance and depot wagon used at West Point Military Academy.

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peditions it has accomplished work which would have been impossible for horses. Once a private was run over by an artillery caisson and so seriously injured that it became necessary to convey him to a hospital twenty miles away. When the motor ambulance rejoined the line of march its services were again requisitioned to transport two cadets, who had become disabled, to the institution from which it had just returned. Before night came on the machine had covered 80 miles and was again on duty with the detachment. Its best work is performed in winter.

* * *

Steam buses and patrol wagons are in pretty general use. The latter, American made, are to be seen in Rio de Janeiro and other foreign cities. American steam buses are to be found in many places both here and abroad. Over a year ago the Dutch government bought five for carrying the mails in Java. For three years the White company has been exporting steam buses to Japan, where one company, operating in the vicinity of Osaka, employs 29 of the machines. American built steam buses are also operating in England, Honolulu and Australia.

CAB STRIKE NOT YET SETTLED.

AFTER practically agreeing to call off the strike among the drivers of the New York Taxicab Company the labor union committee having jurisdiction decided not to do so. The strikers want the company to recognize their union. The company declines to do so.

During the negotiations which failed to produce a settlement of the difficulty the company offered to pay the old scale wage and take back the men as fast as they could be provided with vehicles. But it did not offer to discharge any of the men now in its employ. Before negotiations were broken off the following terms were accepted by both sides: Chauffeurs to be paid 20 per cent of their earnings; twelve hours to constitute a day's work; gasoline to be charged for at cost; time over twelve hours to be deducted from following day's work; men to pay at rate of 10 cents a day for their uniforms, uniforms not to cost more than $36 a year; company to clean all machines; extra men to be given steady employment, according to length of service; no discrimination against union men, no charge by company for trying out competent men; no charge for repairs except for those made necessary by negligence of chauffeur.

MOTOR BUSES IN LONDON.

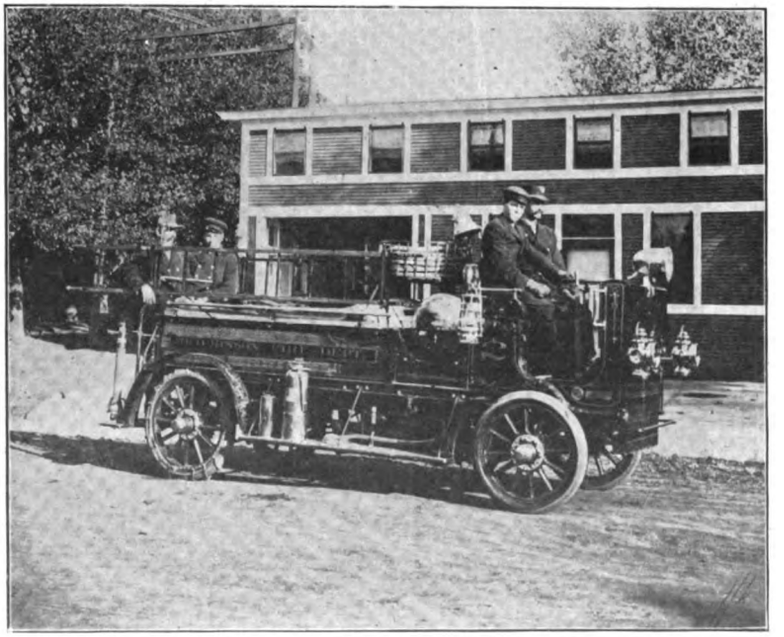
AT THE beginning of November there were 1,086 motor buses in London. The machines were distributed as follows:

Vanguard Company	389
General Company	285
Road Car Company	225
Great Eastern Company	79
Thomas Tilling	36
Electrobus Company	20
Steam Omnibus Company	20
London and Northwestern Railway	5
Central Omnibus Company	16
Miscellaneous owners	11
Total	1,086

REDUCED LIVERY RATES IN CHICAGO.

THE following rates for motor cab and touring car service have been established for the benefit of the Chicago Athletic Club membership:

	Gross Charge.	Discount to Members.	Net to Members.
TAXIGABS.			
First mile	$ .50	20%	$ .40
Second and subseq't miles.	.40	20%	.32
Waiting, 6 minutes	.10	20%	.08
Per hour, 1 to 4 passengers	4.00	20%	3.20
Any downtown depot	.62	20%	.50
TOURING CARS.			
Per hour, 1 to 4 passengers.	$ 4.37	20%	$ 3.50
Each additional passenger.	.62	20%	.50
8-hour day	31.25	20%	25.00
Each additional hour	3.75	20%	3.00



Motor Hose and Chemical Wagon (Rapid) Used by Fire Department in Hutchinson, Kas.

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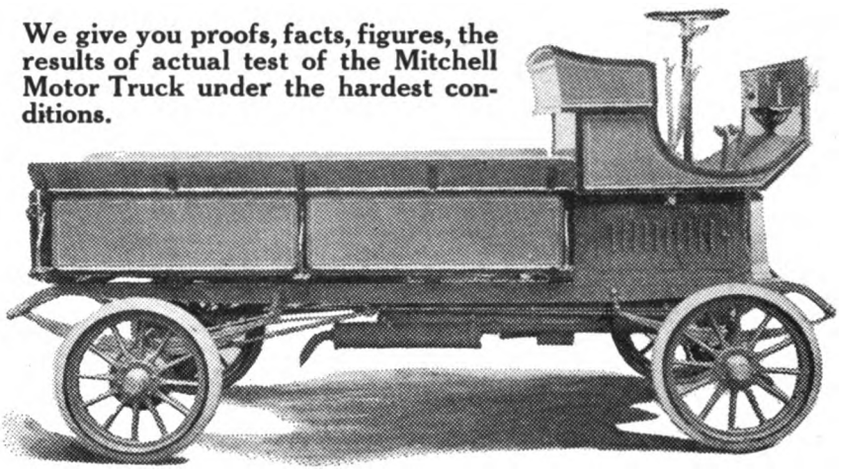
DON'T TAKE MERE CLAIMS OF LOW OPERATING COST!

Mitchell Motor Truck Four-Cylinder 20 H. P.

We give you proofs, facts, figures, the results of actual test of the Mitchell Motor Truck under the hardest conditions.



Capacity One and a Half Tons

4-Cylinder, 20 H. P. Capacity One and One-Half Tons

This is the Motor Truck—the Mitchell—with new and important improvements—which carried a load of 3,400 pounds from Racine, Wis., to New York over some of the worst roads in the United States—made doubly worse by rains—at an actual operating expense of 3.373 cents a mile, **paying the highest price for gasoline and oil along the way.**

Had the truck carried its own gasoline and oil the operating cost **would have been cut squarely in two,** as no owner has to pay such prices for fuel and lubricants as were charged against this machine on this trip.

1,168 miles through mud nearly up to the axles—roads that ordinary automobiles could not "negotiate."

That was undoubtedly the greatest practical test ever made of a motor truck.

Although the Mitchell Truck took this trip a year ago, it is valuable to the Motor Truck user as **a fact** against a multitude of unsupported claims.

You read the assertion of this or that manufacturer that his machine will run at an average of so many cents per mile.

Merely his word for it—not a single item of **performance** on which to base the figures.

This is different. This is **evidence.**

You would doubtless never have to run your Mitchell Motor Truck under conditions as hard as those of the test trip.

But it gives **solid facts** to figure on—8.848 miles on one gallon of gasoline, and 73 miles on one gallon of lubricating oil.

We said the "Mitchell with important improvements."

Since that splendid exhibition we have increased the efficiency of this machine wherever it could be increased.

We have supplied it with a much stronger transmission. We have fortified it in every part possible for even greater demands. In this we have had the invaluable light of this practical test.

Now we offer you—**for $2,000**—an even better machine than that which went the Racine-New York route.

Mitchell

Wheel Base	110 Inches	Tread	56 Inches
Wheels (front), Solid Tires			30x3 Inches
Wheels (rear) Solid Tires			30x3½ Inches
Body, Width (inside measurement)			3 Feet, 7 Inches
Body, Length (inside measurement)			8 Feet
Body, Depth (inside measurement)			14 Inches
Engine, 4-cylinder, Vertical			20 H. P.

Ignition, Magneto and Dry Batteries.
Transmission, Sliding Gear, Three Speeds and Reverse.
Carrying Capacity, 1½ Tons; Axle (front), I-Beam; Axle (rear), Worm Drive
Weight of Truck, complete . . . . . 2,300 Pounds

$2,000

Remember the Mitchell Motor Truck is built in the home of the famous Mitchell Motor cars.

It has all the features of excellence and of material and workmanship that mark the great Mitchell line. It is built entire in the Mitchell factory—not "assembled."

We build the engines. We grind the pistons. We cut the gears. We caseharden the steel. Our crank shaft has 5 large bearings as well as ball thrust to take up lateral shocks. Other crank shafts have only two.

Throughout the car, wherever the best results can be secured, nickel alloy and vanadium steels are used liberally.

These steels are employed in the crankshaft, transmission and rear axle shaft—in all the driving mechanism. The springs are vanadium steel. Aluminum casting are used wherever possible, strengthened with bronze wherever there is any strain.

And **remember,** the Mitchell Motor Truck with its low proven cost of operation—sells for only $2,000.

Write us!

Mitchell Motor Co., 561 Mitchell St., Racine, Wis.

Standard Manufacturers A. M. C. M. A.

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Electric cabs are being operated with considerable financial success in Munich, Bavaria.

The electric street cleaning machine used in Berlin has been so economical that the municipality has concluded to buy five more like it.

The three zone motor bus fare system has been abandoned in Philadelphia. A two zone system takes its place. The fare common to both zones is five cents.

Excessive speed is so much dreaded by London motor bus companies that inspectors are especially employed to report drivers who offend in this particular. The legal speed is 12 miles per hour.

As many of the horses used by the Kansas City fire department are regarded as unfit for service, the recommendation has been made that they be sold and the proceeds used to buy a motor driven hose and chemical wagon.

Motor wagons are hauling express matter and light freight between Derry and Manchester, N. H.

A coffee and spice company in St. Louis has decided to supply its city salesmen with automobiles. The novelty of the enterprise is still fresh enough to be remarkable. In a short time, however, such machines will be in common use in both city and country.

At the close of last September there were 2,273 licensed motor cabs in London. Of these machines 1,235 are of European origin. At the same time there were 8,849 horse drawn cabs in service. One year ago there were over 11,000 of the latter vehicles.

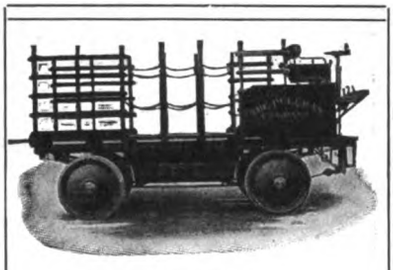
It is proposed to connect Crystal Park and Manitou, Colo., by a motor bus line which will operate over private right of way. If the experiment is successful the promoters of the enterprise will acquire other parks and lake resorts throughout the state and similarly connect them with the nearest towns and cities.

ATTRACTIVE ARRANGEMENTS CAN BE MADE FOR RENEWALS FOR "Exide" VEHICLE BATTERIES

THE GENUINE "EXIDE" PLATE HAS "EXIDE" MOULDED ON THE LUG AND IS MANUFACTURED BY

THE ELECTRIC STORAGE BATTERY CO. PHILADELPHIA

SALES OFFICES: NEW YORK BOSTON CHICAGO ST. LOUIS CLEVELAND ATLANTA SAN FRANCISCO TORONTO



4 Wheel Drive
4 Wheel Steer
4 Sizes, 1 to 5 tons

The Indestructible Couple-Gear

¶ Constructed throughout from cast steel and forgings. Power applied direct to rim of wheels.

¶ No countershafts, sprockets or chains to maintain. Electric transmission. Either Generator or Battery driven.

WRITE FOR CATALOGUE. AGENTS WANTED.

COUPLE-GEAR FREIGHT-WHEEL COMPANY
550 Buchanan Street, GRAND RAPIDS, MICH.

The "Randolph"

Telephone Main 2213

The most serviceable, the strongest, most durable, simplest motor truck on the market. Masterly design. Not a flimsy, dishonest piece of material used in its entire makeup, and the price is a fair one, both to the manufacturer and the purchaser.

A demonstration is convincing.

Built in four sizes, from ½-ton Delivery Wagon to 7-ton Truck.

Sales Office: 175 E. Randolph Street, Chicago.
Factory: 3900-4000 Union Avenue, Chicago.

Randolph Motor Car Co.

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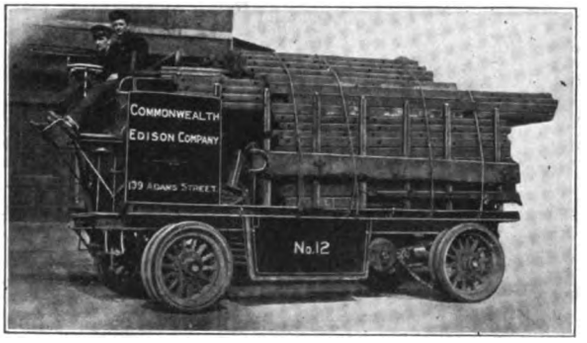
If you Manufacture, Own or Intend Purchasing

Commercial Electric Vehicles



READ THE FOLLOWING:

THE COMMONWEALTH EDISON COMPANY is ready at all times to co-operate with manufacturers and owners of Commercial Electric Vehicles in improving and perfecting the service of this type of truck which has grown constantly in popular favor the past few years.

A number of Chicago's largest commercial houses are utilizing electric trucks with notable success; more would doubtless use them if they were familiar with the superior facilities provided for their use.

We Maintain Charging Plugs

at nearly all of our stations and sub-stations for the accommodation of those operating electrical vehicles of any kind.

We would be glad to advise any one in Chicago contemplating the purchase of an electric vehicle as to where they may make arrangements for charging and up-keep.

We Install Charging Outfits for Private Use

anywhere in Chicago and can refer to a number of installations. We solicit correspondence from manufacturers of traffic vehicles; also from those intending to purchase.

Commonwealth Edison Company

139 Adams Street, Chicago

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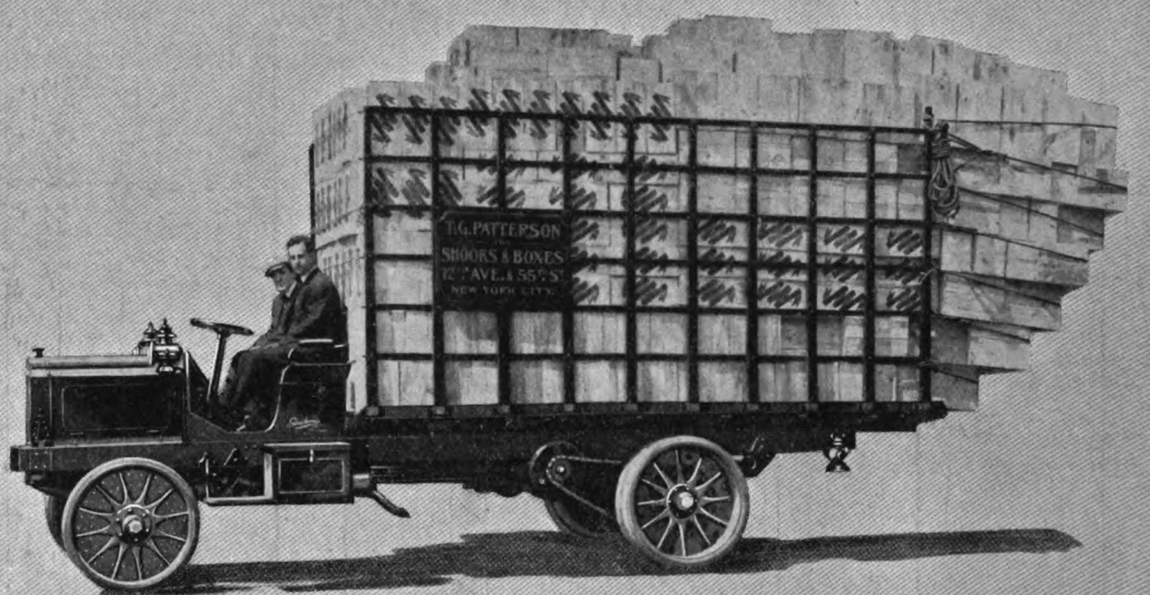
Packard TRUCK



Normal load capacity, 3 tons. Price, in standard equipment and finish, $3,850, f. o. b. factory. Special bodies to order.

"BUILT ENTIRELY IN THE PACKARD SHOPS"

Packard Motor Car Company
Detroit, Michigan

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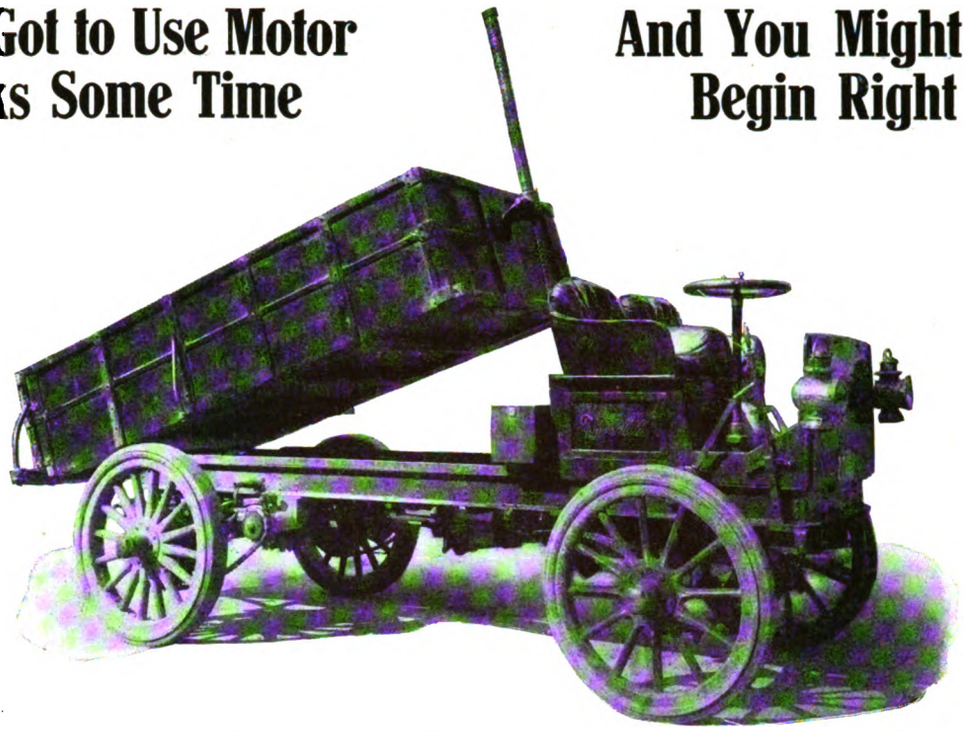
You've Got to Use Motor Trucks Some Time

And You Might as Well Begin Right Now



Regardless of the loads you have to transport, the Frayer-Miller Gasoline Truck will do your work economically and expeditiously. Regardless of the cold weather it will do it continuously. Its air-cooled four-cylinder engine works more satisfactorily in winter than a machine whose power plant is water-cooled. No freezing of the circulation. No interruptions to service—for which you have to pay. Regardless of what any prejudiced person may say, the motor truck—and particularly ours—will haul merchandise cheaper than horses if there is enough work for it to do. If there isn't enough work for the machine, stick to your draft animal transportation. Bodies to order.

Oscar Lear Automobile Co., Springfield, Ohio

A PAYING INVESTMENT

Do you believe that, in the majority of cases, city merchandise can be more economically transported by power wagons than by horses?

Of course you do.

But do you know the extent of the economy to be gained by the substitution of motor trucks and wagons for horse drawn vehicles?

Few people do.

"The Power Wagon" aims to assist every branch of business in which local transportation plays an important part, by showing how and to what extent motor vehicles may be used to advantage—the peculiarities of each business duly considered.

Possibly such work interests you.

If it does you should subscribe for the paper.

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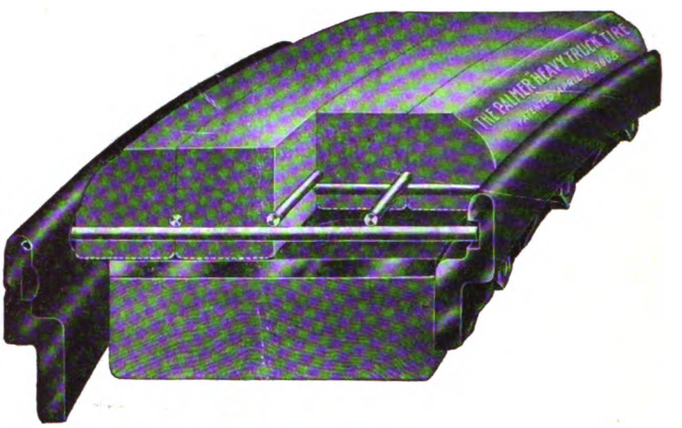
Cut Down Your Operating Expense by Using the H. A. Palmer Tire

We unhesitatingly declare that H. A. Palmer tires are the most economical for those who employ heavy duty motor wagons. **They are made sectional.** Any section, or part of one, can be taken out of the rim. (Of course you know that all parts of a tire are not subjected to the same degree of wear.)

The method of fastening is the best which has yet been devised. The tires cannot fly from the rim nor creep. No machine is required in applying. A common wrench and a hammer are all the tools needed.

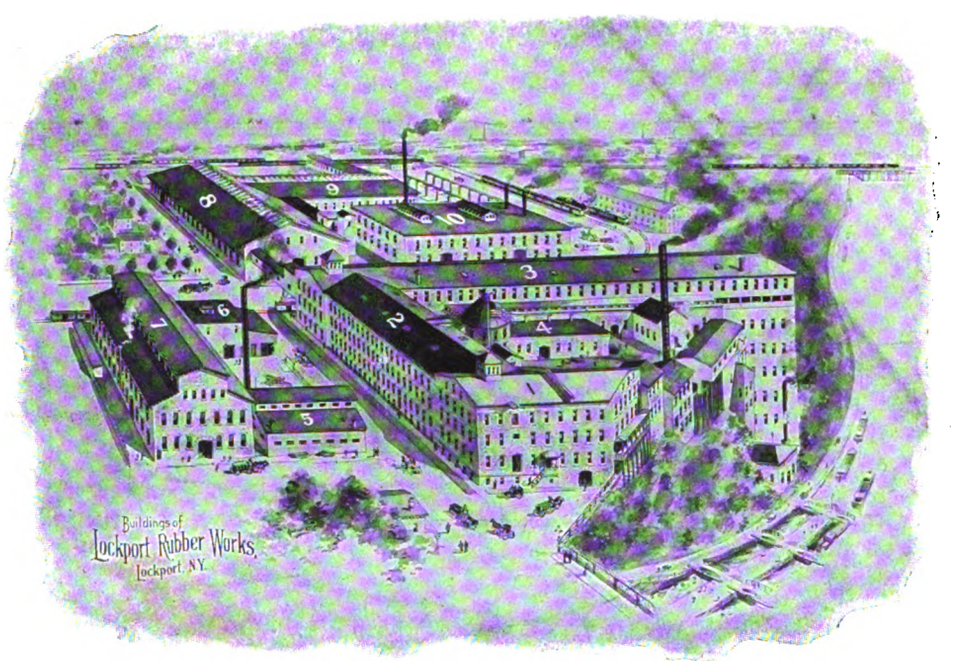
The tires are easily and quickly put in position. They can be removed without the slightest trouble.

The cross rods move slightly with the rubber and **prevent the tire from giving out in the base.**



The H. A. Palmer Sectional Tire for Heavy Loads

A five ton truck fitted with H. A. Palmer tires has been operating in Ohio since last October, without any evidence of undue tire wear. This would indicate that the principle by which the H. A. Palmer tire is retained is correct. **There is no tearing away of the rubber from the wires.**



Plant of the Lockport Rubber Works Where the Palmer Tire is Made

Each circumferential section of the tire is endless. Holes are molded in the rubber for the lateral wires. The circumferential wires are electrically welded and fit over the cross wires. **Holes are not molded in the rubber for these circumferential wires,** they being held in position by the pressure of the rubber sections within the flanges. Observe that the ends of the cross wires are fitted into slots in the flanges. **This construction permits the cross wires to move slightly within the rubber when the tire is subjected to severe strain as in starting.**

If you want a durable tire, one which will cause no interruption to the road service of your machines, you should carry the Palmer in stock. It is the best investment you can make.

Lockport Rubber Works, Lockport, N. Y.

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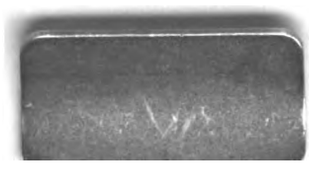

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